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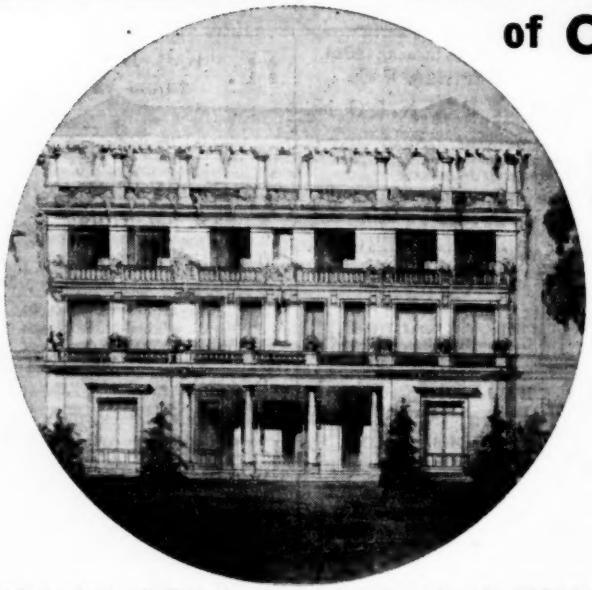

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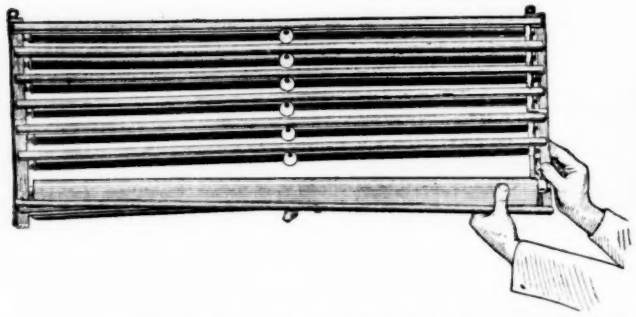

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variations are compared. Between the years 1876 and 1889 the annual curve which gives the variations of bronchitis possesses two maxima, one at the end of January and the second in the middle of March. From this point the decline in the number of deaths from bronchitis is very rapid. The reappearance of the disease dates from the beginning of October. When the eight years 1889 to 1896, however, are examined, it is found that the maximum numbers of deaths from bronchitis occur in the second week of January and in the last week of February. Both these maxima are a fortnight before the maxima of the epidemics of influenza as before found. This suggests that the advent of influenza has brought a change in the seasonal prevalence of bronchitis, and also supports the view that the earlier portion of the influenza epidemic is associated with bronchitic symptoms. The same phenomenon holds for pneumonia as a like alteration has occurred in the seasonal curve of the death-rates of this disease before and after 1889. The maximum numbers of deaths from pneumonia are thrown earlier into the year and precede the maximum number of deaths from influenza by about a week.

What of the future? From July 13th, 1918, to March 1st, 1919, the maximum points of two of the last epidemics is 33 weeks; from March 1st to Oct. 1st is also 33 weeks. An epidemic is therefore due, but it falls at the unsuitable season of the year and should therefore be small. With regard to the aberrant October epidemic, this might be expected to have been followed by an epidemic in June, a season of the year at which an epidemic is still possible but very unlikely. If the October epidemic, therefore, has a 33 weeks sequence, the next epidemic would occur in January or February of the New Year. Of course, it is to be remembered that the intervals between epidemics are never exact; only their average approaches exactitude. A month either way is of no moment.

Medical News.

SOCIETY OF APOTHECARIES OF LONDON.—At examinations held recently the following candidates passed in the subjects indicated:—

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The Diploma of the Society was granted to the following candidates entitling them to practise medicine, surgery, and midwifery: C. E. G. Busbridge, J. Kershaw, and J. L. Walker.

THE MEDICAL AND DENTAL DEFENCE UNION OF SCOTLAND, LTD.—The seventeenth annual report of this union, dealing with the year ending August, 1919, will be submitted to the annual meeting at the offices, 155, St. Vincent-street, Glasgow, on Nov. 10th. The report shows a very satisfactory financial position, the income for the year being £839, including £152 of revenue from invested funds. The assets of the union now amount to £3266, and the balance of revenue over expenditure is £76. During the year two new committees have been established—namely, a committee on dental legislation to deal with problems arising out of the Departmental Committee on Dentistry and the projected legislation thereon, and an Insurance Acts Committee to deal with questions arising under the National Health Insurance Act. A larger number of claims have been made and actions raised against members of the union in this than in any previous year, but the knowledge that the Council had investigated the facts and was prepared to defend the member was sufficient in many cases to avoid litigation.

THE BETHLEM ROYAL HOSPITAL.—An out-patients' department has now been established in connexion with the Bethlem Royal Hospital. The institution, which is really a new hospital for nervous diseases, is at 52, Lambeth-road, S.E., quite apart from the main block of the hospital. This progressive movement is in deference to the scientific view, which has at last attracted public attention, that the treatment of early cases of mental disease is of first value to the community. The new hospital is for the reception as out-patients of persons suffering from diseases of the nervous system, who are unable to pay the cost of obtaining treatment; and the regulations governing the admission and treatment of patients make a special mention of encouraging professional consultation between members of the hospital staff and the medical practitioners in attendance upon the patients. If the new department of the Bethlem Royal Hospital is faithfully run, as the constitution of the staff makes perfectly certain that it will be, it should prove a great help by providing early advice before the condition of the patient has become so acutely urgent as to require the medico-legal label of insanity.

Medical Diary for the ensuing Week.

SOCIETIES.

ROYAL SOCIETY, Burlington House, London, W.

THURSDAY, Nov. 13th.—Papers:—Prof. W. B. Bottomley: The Effect of Nitrogen-fixing Organisms and Nucleic Acid Derivatives on Plant Growth (communicated by Prof. F. W. Oliver).—Mr. W. Robinson: The Microscopical Features of Mechanical Strains in Timber and the Bearing of these on the Structure of the Cell-wall in Plants (communicated by Prof. W. H. Lang).—Agnes Arber: The Vegetative Morphology of Pistia and the Lemnaceæ (communicated by Prof. F. W. Oliver).—Lieut.-Col. R. McCarrison: The Genesis of Œdema in Beri-beri (communicated by Prof. J. G. Adami).—Mr. W. J. Young, Mr. A. Breinl, Mr. J. J. Harris, and Mr. W. A. Osborne: Effect of Exercise and Humid Heat upon Pulse Rate, Blood Pressure, Body Temperature and Blood Concentration (communicated by Prof. J. N. Langley).

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

MEETINGS OF SECTIONS.

Monday, Nov. 10th.

WAR (Hon. Secretaries—H. B. Hill, Oliver Robinson, J. McIntyre): at 5.30 P.M.

Presidential Address:

Surg. Rear Admiral Sir Robert Hill, K.C.M.G., C.B., R.N.: A Retrospective View of Naval Medical Conditions.

Tuesday, Nov. 11th.

PSYCHIATRY (Hon. Secretaries—Bernard Hart, G. F. Barham): at 5.30 P.M.

Paper:

Sir Frederick W. Mott, K.B.E., M.D., F.R.S.: Study in the Pathology of Dementia Præcox.

Wednesday, Nov. 12th.

SURGERY: SUB-SECTION OF PROCTOLOGY (Hon. Secretaries—W. Sampson Handley, Gordon Watson): at 5.30 P.M.

Short Papers:

Mr. Swinford Edwards: The Treatment of Procidentia by Injections.

Mr. Hamilton Drummond: On War Wounds of the Rectum, with Especial Reference to Treatment.

Cases and Specimens:

Mr. Lockhart-Mummery: (1) Case of Intestinal Coccidiosis; (2) Case of Multiple Adenomata of the Colon with Secondary Carcinoma; (3) Case of Sarcoma of the Rectum.

Mr. Graeme Anderson: Case of Piles of Unusual Size and Duration.

Mr. Percival P. Cole: Case of Carcinoma of the Colon after Resection.

Thursday, Nov. 13th.

NEUROLOGY (Hon. Secretaries—P. W. Saunders, George Riddoch): at 8.30 P.M.

Paper:

Mr. Percy Sargent, C.M.G.: Lessons of the War applied to Spinal Surgery.

N.B.—Members of the Section of Surgery are specially invited to attend this Meeting.

CLINICAL (Hon. Secretaries—T. P. Legg, S. A. K. Wilson): at 5 P.M.

Paper:

Mr. Henry Curtis: Three Cases of Malignant Disease of the Face illustrating Modern Methods of Radical Operation.

Members desiring to show cases will please send particulars to Dr. Kinnier Wilson, 14, Harley-street, W. 1, not later than Nov. 10th.

MEDICAL SOCIETY OF LONDON, 11, Chandos-st., Cavendish-sq., W.

MONDAY, Nov. 10th.—8 P.M., Clinical Evening. Cases will be exhibited by Dr. Poynton, Dr. A. Feiling, Dr. Langmead, Dr. H. Gosse, Dr. R. Miller, Mr. V. L. Cope, Mr. C. W. S. Bryan, Colonel D. Armour, and others. Discussion of the cases will commence at 9 P.M.

TUBERCULOSIS SOCIETY, at the Royal Society of Medicine, 1, Wimpole-street, W.

MONDAY, Nov. 10th.—8 P.M., Address:—Dr. H. A. Ellis: Abdominal Tuberculosis in connexion with Phthisis. Followed by business meeting.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

ROYAL COLLEGE OF PHYSICIANS OF LONDON, Pall Mall East.

TUESDAY, Nov. 11th.—5 P.M., FitzPatrick Lecture:—Dr. E. G. Browne: The Origins and Development of Arabian Medicine—I. The Translations (VII.-IX. Cent.).

THURSDAY.—5 P.M., FitzPatrick Lecture:—Dr. E. G. Browne: The Origins and Development of Arabian Medicine—II. Four Great Medical Writers of Persia (IX.-XI. Cent.).

ROYAL INSTITUTE OF PUBLIC HEALTH, in the Lecture Hall of the Institute, 37, Russell-square, W.C.

Course of Lectures on Housing Problems and Town Planning in Relation to Public Health.

WEDNESDAY, Nov. 12th.—4 P.M., Lecture III.:—Prof. P. Abercrombie: Town Planning and Public Health.

Course of Instruction for Candidates as Tuberculosis Officers, General Practitioners and others. Bacteriological Demonstrations will be given in the Laboratories of the Institute, and visits arranged to Sanatoriums, Tuberculosis Dispensaries, &c.

THURSDAY, Nov. 13th.—5 P.M., Lecture VI:—Dr. C. Riviere: The Pneumothorax Treatment of Pulmonary Tuberculosis.

HOSPITAL FOR CONSUMPTION AND DISEASES OF THE CHEST, Brompton, S.W.

WEDNESDAY, Nov. 12th.—4.30 P.M., Lecture:—Dr. C. Wall: Post Sanatorium Treatment.

NATIONAL HOSPITAL FOR THE PARALYSED AND EPILEPTIC, Queen-square, W.C. 1.

MEDICAL SCHOOL.

MONDAY, Nov. 10th.—2-3.30 P.M., Out-patient Clinic: Dr. Collier. 3.30 P.M., Lecture:—Dr. James Taylor: Syringomyelia.

TUESDAY, Nov. 11th.—2-3.30 P.M., Out-patient Clinic: Dr. Grainger Stewart. 3.30 P.M., Ward Cases: Dr. Risien Russell.

WEDNESDAY, Nov 12th.—2 P.M., Lecture:—Mr. Armour: Surgery of the Spinal Cord. 3.30 P.M., Lecture:—Dr. James Taylor: Epilepsy.

THURSDAY, Nov 13th.—2-3.30 P.M., Out-patient Clinic: Dr. Farquhar Buzzard. 3.30 P.M., Lecture:—Dr. Aldren Turner: Neuroses.

FRIDAY, Nov. 14th.—2-3.30 P.M., Out-patient Clinic: Dr. Gordon Holmes. 3.30 P.M., Ward Cases: Dr. Aldren Turner.

Fee for Post-Graduate Course £5 5s. C. M. Hinds Howell, Dean.

NATIONAL HOSPITAL FOR DISEASES OF THE HEART POST-GRADUATE COURSE, Westmoreland-street, W.

MONDAY, Nov. 10th.—11 A.M., Out Patients: Dr. Goodall. 2 P.M., In-patients: Dr. Moon.

TUESDAY.—2 P.M., Out-Patients: Dr. R. Wells. 2.30 P.M., In-patients: Dr. Gibbes.

WEDNESDAY.—2 P.M., Out-patients: Dr. Moon. 5.30 P.M., Lecture:—Dr. Price: Auricular Fibrillation.

THURSDAY. 10 A.M., In patients: Dr. Hamill. 2 P.M., Out-patients: Dr. Price.

FRIDAY.—2 P.M., Out patients: Dr. Gibbes. 2 30 P.M., In patients: Dr Wells.

SATURDAY.—10 A.M., Out-patients: Dr. Hamill.

ST. JOHN'S HOSPITAL FOR DISEASES OF THE SKIN, 49, Leicester-square, W.C.

THURSDAY, Nov. 13th.—5 P.M., Chesterfield Lecture:—Dr. M. D Darrell: The Early Lesions of Syphilis and their Treatment.

CONJOINT BOARD OF SCIENTIFIC SOCIETIES, Royal Society, Burlington House, W.

WEDNESDAY, Nov. 12th.—5 P.M., Discussion of Draft Report on the Metric System.

MANCHESTER ROYAL INFIRMARY POST-GRADUATE CLINIC.

TUESDAY, Nov. 11th.—4.30 P.M., Lecture:—Dr. E. M. Brockbank: Aortic Valve Disease

Appointments

Successful applicants for vacancies, Secretaries of Public Institutions, and others possessing information suitable for this column, are invited to forward to THE LANCET *Office, directed to the Sub-Editor, not later than 9 o'clock on the Thursday morning of each week, such information for gratuitous publication.*

COLLETT, H. R. P., L.D.S. R.C.S. Eng., has been appointed Honorary Dental Surgeon to the Salford Royal Hospital.

FIRTH, DOUGLAS, M.D. Cantab., M.R.C.P., Junior Physician to King's College Hospital, and Honorary Physician to the Royal National Orthopædic Hospital.

HAWKER, G. P., M.D., B.C. Cantab., Surgeon to the West of England Eye Infirmary, Exeter.

RAMSBOTTOM A., M.D., Ch.B. Vict. U., Manch., one of the Medical Referees under the Workmen's Compensation Act, 1906, for County Court Circuits Nos. 7 and 8.

SMITH, G. FOSTER, L.M.S.S.A., Assistant Medical Officer to the Crumpsall Union Infirmary, Manchester.

TAYLOR, H. NEVILLE, M.D. Dub., barrister-at-law, reappointed Medical Referee, Ministry of Pensions.

Vacancies.

For further information refer to the advertisement columns.

Aberdeen University.—Secretary. £600 to £800.

Birmingham and Midland Ear and Throat Hospital.—H.S. £400.

Birmingham and Midland Eye Hospital, Church-street, Birmingham.—Asst. &c. £100.

Blackburn and East Lancashire Royal Infirmary.—Junior H.S. £250.

Blackburn Union.—Res. M.O. £400.

Bradford Royal Infirmary.—H.P. £200.

Brighton County Borough. Asst. M.O. £450.

Brighton Royal Sussex County Hospital.—S. and Asst. S.

Canterbury, Kent and Canterbury Hospital.—Two Res. M.O.'s. £200 and £150 respectively.

Cardiff, Glamorgan County Council.—County M.O. £1000.

Cardiff, University College of South Wales and Monmouthshire.—Lect. in Physiol. Chem. and Asst. Lect. and Demon. in Physiol. £250

Central London Ophthalmic Hospital, Judd-street, W.C.—Asst. S.

Chester, Cheshire County Council.—Dist. Tuberc. O. £450.

Colchester, Essex County Hospital.—H.S. £200.

Croydon Mental Hospital, Upper Warlingham, Surrey.—Sec. Asst. M.O. £500.

Derby, Derbyshire Royal Infirmary.—Hon. Asst. S.

Dumfries, Crichton Royal.—Asst. P. £350.

Eastbourne County Borough.—Female Asst. M.O. £450.

East London Hospital for Children and Dispensary for Women, Shadwell, E.—Two Asst. P.'s, Two Asst. S.'s, Oph. S., and Throat and Ear S.

Ebbw Vale Urban District Council.—M.O.H. and Sch. M.O. £750.

Exeter, Royal Devon and Exeter Hospital.—Asst. Pathologist, Asst. S., and Surgical Registrar.

Gloucestershire Royal Infirmary and Eye Institution.—Asst. S.

Halifax Royal Infirmary.—H.S.

Hospital for Consumption and Diseases of the Chest, Brompton, S.W.—Anæsthetist.

Huddersfield Royal Infirmary.—Sen. H.S. and Asst. S. £200 and £150 respectively.

Johannesburg, South African School of Mines and Technology.—Prof. of Veterinary Anat. £800.

King's College Hospital, Denmark-hill, S.E.—Path. Regis., Clin. Path., and Bact. Sambrooke Med. Regtr. Sambrooke Surg. Regtr.

Leeds.—Sec. Asst. M.O. for Indoor Institutions, Beckett-street. £300.

Lightburn Joint Hospital, Shettleston, near Glasgow.—Res. Phys. Supt. £350.

Liverpool, Brownlow Hill Poor-law Hospital.—Res. Asst. M.O. £300.

London Hospital, E. Director of Surg. Unit and Director of Med. Unit. £2000 each. Asst. Ophthal. S. Two Res. Anæsts. £50. Surg and Med. Clin. Asstş

Manchester Royal Eye Hospital.—Jun. H.S. £120.

Manchester Royal Infirmary.—H.S.'s. £25 and £50.

Manchester, St. Mary's Hospitals.—Hon. Asst. S.

Mesopotamia, Civil Medical Service.—Civil S.'s, Ophthal. S., Path., Dental S., and M.O.H. Rs. 750 to Rs. 1500 a month.

National Hospital for the Paralysed and Epileptic, Queen-square, W.C.—Hon. Dent. S. Also H.P.

Newport, Mon., Royal Gwent Hospital.—House S. and Cas. O. £200 and £180 respectively.

Northampton, Northamptonshire County Council Education Committee.—School Dentist. £400.

Nottingham General Hospital.—H.S. £150.

Preston, High Carley Sanatorium, near Ulverston.—Asst. Tuberc. M.O. £400.

Preston, Lancs, County Asylum, Whittingham.—Locum Tenens. £7 7s. per week.

Queen Charlotte's Lying-in Hospital, Marylebone-road, N.W.—Asst. Res. M.O. £60.

Reading, Royal Berkshire Hospital.—H.P. and Sec. H.S. £200.

Rochdale Infirmary and Dispensary.—Junior H.S. £125.

Royal Free Hospital, Gray's Inn-road, W.C.—Res. H.S.'s. £50. Hon. Asst. Dental S.

Ryde, Royal Isle of Wight County Hospital.—Res. M.O. £250.

St. Helens County Borough.—Asst. M.O.H. £400.

Sheffield Education Committee.—School Dental S.'s. £400. Asst. School M.'s. £550

Sheffield, East-End Branch of the Children's Hospital.—H.S. £150.

Sheffield Royal Hospital.—Res. Asst. Cas. O. £120.

Sheffield Royal Infirmary.—H.S. £150.

Singapore, Straits Settlements, Health Department.—Asst. Health O. $4800-$5400.

Smethwick County Borough.—Female Asst. M.O.H. and Sch. M.O. £500.

Taunton and Somerset Hospital.—Sen. and Jun. H.S.s. £250 and £150.

Ventnor, Isle of Wight Royal National Hospital for Consumption and Diseases of the Chest.—Asst. Res. M.O. £200.

Wakefield County Council of the West Riding of Yorkshire.—Chief Tuberc. O. £750.

Warrington Infirmary and Dispensary.—Junior H.S. £200.

Wells Asylum, Somerset.—Asst. M.O. £300.

Winchester, Hampshire County Council.—Two Asst. M.O.'s. £450.

THE Chief Inspector of Factories, Home Office, S.W., gives notice of vacancies for Certifying Surgeons under the Factory and Workshop Acts at Eastbourne, Fleetwood, and Princes Risborough.

Births, Marriages, and Deaths.

BIRTHS.

ALLFREY.—On Oct. 26th, at Froxfield, Southwick, Sussex, the wife of Frederic Henry Allfrey, M.A., M.B., B.C. Cantab., late Captain, R.A.M.C., of a son.

CATFORD.—On Oct. 29th, at Crouch Hall-road, Crouch End, N., the wife of Eric Catford, Captain (acting Major), R.A.M.C., of a son.

HAMILTON.—On Nov. 2nd, at Aldersyde, Weybridge, the wife of Allan G. Hamilton, M.D., F.R.C.S. Edin., of a daughter.

MURCH.—On Oct. 30th, the wife of Dr. Augus H. Murch, Sutterton, Boston, Lincs., of a son.

RICE-OXLEY.—On Nov. 2nd, at Victoria-road, Kensington, W., the wife of Douglas Rice-Oxley, M.C., M.B., B.S., of a son.

RIDOUT.—On Oct. 30th, at St. Elmo, Clarendon-road, Southsea, the wife of C. A. Scott Ridout, M.S., F.R.C.S., of a daughter.

DEATHS.

GORDON.—At Howden Isolation Hospital, of scarlet fever, William Bannalie Gordon, Jun., M.B., B.C. (Cantab.), late Captain, R.A.M.C. in his 31st year.

LAING.—On Oct. 31st, at Birkdale, Norman Preston Laing, M.D., M.Sc., in his 51st year.

OAKLEY.—On Oct. 29th, at Southport, John Oakley, J.P., surgeon, of Holly House, Halifax, in his 78th year.

N.B.—A fee of 5s. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Notes, Short Comments, and Answers to Correspondents.

MEDICAL FEES IN JOHANNESBURG.

THE generosity of the decision of the Witwatersrand Branch of the B.M.A., quoted in another column of our present issue by our South Africa Correspondent, with regard to free medical treatment to dependents of soldiers, constitutes an effective reply to the criticisms recently made in the House of Assembly against the cupidity of the profession on the Rand. They have been accused of extortionate charges in the following terms (we quote from the *Cape Times* report of a question in the House of Assembly on Tuesday, Sept. 9th):—

Is the Minister of the Interior aware (*a*) that during the influenza epidemic instances occurred of wholly extortionate charges being made for medical attendance by certain doctors; (*b*) that the medical fraternity of Johannesburg have raised their fees as from Sept. 1st, 1919, to 15*s.* per visit up to 6 P.M., £1 1*s.* up to 9 P.M., and an indefinite amount in excess of this after 9 P.M., alleging as the reason for such action the increased cost of living; (*c*) that during war periods these doctors in Johannesburg who did not go on active service made incomes far in excess of their pre-war earnings; (*d*) that the charges for medical attendance make payment of doctors' bills a crushing burden to the industrial and middle classes in Johannesburg, and add greatly to the social and industrial unrest now prevailing?

The answers to these questions were of the usual non-committal nature, except for (*a*), to which the Minister of the Interior replied:—

"The Government received reports of extortionate charges in some cases, but has no information whether the amounts so charged were actually paid."

We have not very much sympathy with the citizens of Johannesburg—a wealthy community on the whole—as they seem to forget that the increased cost of living, to which they attribute their difficulty in paying doctors' fees, equally affects the medical profession. The raised prices do not seem to us excessive; there is a large and excellent hospital, with over 500 beds, in Johannesburg for those who live in the town, and the outlying mines have their own benefit societies, resident doctors, and, in most cases, local hospitals. On the other hand, now that the doctors have themselves fixed a tariff for night work the public have a right to demand prompt attention to night calls. We have not heard that a satisfactory sclution has been reached for this problem of night work, on which we commented in September (THE LANCET, Sept. 20th, p. 551). It is our experience that the general public rarely complain of high medical fees if they are satisfied with the attention they receive.

ON OUR DEFENCE.

AN esteemed correspondent inquires whether all the present staff of THE LANCET consists of bacteriologists; the answer is in the negative, but the implied criticism of the contents of recent issues is justifiable, and deserves as satisfactory a rejoinder as we can supply. It is true that for many years there has been a progressive increase in the space allotted to bacteriology in its wider sense. A dive at random into our yearly volumes from 1880 to 1900 shows that while the balance was then held, as well as we were able to hold it, between the various systems of the body, disease was discussed almost exclusively from the clinical standpoint. If the balance has shifted, we hope that it is due to the alteration in comparative values of what has to be said in a medical journal, desiring to deal alike with the art and the science of medicine. The clinical and therapeutical aspect must always remain the most urgently important. Readers whose interests are necessarily centred round the personal element in medical practice may tire of articles dealing with the life-history and evil habits of the minute enemies of human existence. Instead of finding new methods crisp and practical, whereby the bodily ailments of actual men and women may be more expeditiously diagnosed and cured, the practitioner encounters contradictory theories and a host of apparently irrelevant detail with no application to daily medical practice. It is our endeavour to do justice to both sides, and to show by our pages their inter-relations.

A circular has reached us addressed last week to the parents of all the students in one of our leading women's colleges by the principal, the subject being prophylactic vaccination against influenza. This course is advocated by the college doctor on the ground that, even should inoculated persons not be rendered entirely immune to the disease, yet the attacks will be milder and rarely followed by pneumonia. As a consequence of this letter some hundreds of general practitioners up and down the country will be consulted by parents of scholars, and will have to make up their minds promptly and give a decision that in the present state of public information will be subjected to intelligent criticism. They will doubtless be called upon to comment on the value of a prophylactic vaccine at a time when no epidemic has arrived and when the period over which immunity (if any) is conferred has not been finally established; they may have to answer questions on the probability of Pfeiffer's bacillus being the cause of influenza as against a filterable virus, and to estimate the utility of a vaccine for a disease the cause of which is unknown. The assertion that pneumonia is less liable to follow the influenza of inoculated persons may have to be examined in the light of its bacterial causation and the composition of the vaccine to be used. It may be that some inkling of the new outlook in regard to the non specificity of vaccines has reached his patients and require elucidation. The family practitioner will be the first to realise that the inoculation of a large number of educated people of the same age and sex, living under similar conditions, would form an admirably controlled scientific experiment. The problems arising out of this circular letter suggest that in opening our columns generously to bacteriological research we are acting with full appreciation of the needs of those not specially interested in this subject for its own sake.

We agree that certain communications that have appeared in our columns would have been, as it happens, more suitable to a purely technical publication, but it is not easy to foresee when any piece of work, if only by the light that it throws upon laboratory procedure, may not become of real clinical importance.

Lastly, we welcome our correspondent's criticism.

THE WEARING OF DECORATIONS WITH MORNING DRESS.

MANY members of the medical profession entitled to carry decorations or medals may not know exactly how these honours are worn with morning dress on official occasions and at public functions. We therefore reprint here the instructions issued in the *London Gazette* of Oct. 31st:—

Knights Grand Cross or Commanders, Dames Grand Cross, and Knights or Dames Commanders should wear the *Star only* on the left breast of the coat or in a corresponding place on the dress, as the case may be.

Members of the Order of Merit, men who are Members of the Order of the Companions of Honour, Companions of the several Orders of Knighthood, Commanders of the Royal Victorian Order, and men who are Commanders of the Order of the British Empire should wear the ribbon to which the Badge is suspended under the tie, *which should be a bow*, the badge hanging about three-quarters of an inch below the bow.

Women who are Members of the Order of the Companions of Honour, Companions of the Distinguished Service Order, Officers of the Order of the British Empire, Members of the 4th and 5th Classes of the Royal Victorian Order, Members of the Order of the British Empire, and persons who have been decorated with the Victoria Cross, the Royal Red Cross, the Distinguished Service Cross, the Military Cross, the Distinguished Flying Cross, the Air Force Cross, and persons who have been awarded medals should wear the Badges, Decorations, and Medals on the left breast of the coat, or in a corresponding place on the dress, as the case may be.

The method of wearing the *ribbons* of Orders, Decorations and Medals, which will be the same in all cases, both for men and women, is as follows:—A piece of the ribbon one and a half inches wide, or the width of the metal ribbon, and half an inch in depth, mounted on a bar of metal in the form of a brooch, to be worn on the left breast of the coat, or in a corresponding place on the dress, as the case may be. It is notified that these regulations refer to Morning Dress only, and do not alter the regulations with regard to wearing Orders, Decorations, and Medals with Uniform, or with Evening Dress.

Holders of the above distinctions may wear decorations or medals on all occasions at their own discretion.

COLONIAL HEALTH REPORTS.

Weihaiwei.—This territory, which lies in latitude 37·30 N., longitude 122·10 E., on the north-eastern coast of the Shantung Peninsula, was leased to Great Britain by China in 1898 in order to provide the former with a suitable naval harbour and for the better protection of British commerce in the neighbouring seas. During the year 1918 Weihaiwei fully maintained its reputation as a health resort during the summer months. All the accommodation available in the mainland and island hotels and in the bungalows owned by the local land and building company was fully occupied, and the number of visitors was quite as large as in the previous years, if not larger. The health of both residents and visitors during the warm weather was excellent, but there were two outbreaks of epidemic disease during the spring and towards the end of the year. The first was an outbreak in spring of typhus in the depôt in which Chinese labourers, recruited for service in Europe, were housed; the second was an epidemic of influenza which prevailed throughout the territory during October and November. Typhus was declared to be present in the depôt on Feb. 19th and lasted till April 9th. There were 298 cases and 18 deaths, all Chinese with the exception of Dr. Baxter, medical officer in charge of the depôt. The disease first appeared in coolies who arrived from

Tientsin. As the total number of inmates of the depôt when the outbreak occurred was 2519, great credit is due to the Canadian medical officers in charge for the able manner in which they combated the disease and for the efficiency of their administration which prevented its spread. The late Dr. Baxter contracted the disease in the execution of his duty and his death was deeply regretted by all who knew him, as he was held in very high esteem. The epidemic of influenza was universal throughout the territory in a very virulent form. In one family of eight six died of the disease, and in all 900 deaths were reported. It is not possible to give accurate mortality statistics, as registration of deaths is not compulsory. Great improvements are being effected on the Island of Liu Kung with a view to rendering it a health resort in every way satisfactory for His Majesty's Navy. Since 1909 the importation, sale, and smoking of opium and any other hypnotic have been prohibited, and only those who can produce a certificate from the Government medical officer stating that opium is necessary for them are granted a licence to smoke it, the issue of opium to such certified persons being made by the Government. The total number of licences issued during 1918 was 40 and the average age of the licensees 61. The Chinese of the territory have well maintained their reputation for good behaviour.

TO KING'S COLLEGE HOSPITAL MEDICAL STUDENTS.

To the Editor of THE LANCET.

SIR,—I should be glad to hear from former medical students living within easy distance of London, who qualified in 1912 or later, and who would like to play in the King's College Hospital Rugby Football Team.

I am, Sir, yours faithfully,

S. C. RANNER,
Secretary of the Medical School.

Nov. 4th, 1919.

MEDICAL SCHOLARSHIPS FOR THE WAGE-EARNER.

THE late Mr. Francis Fletcher, a director of Wyleys, Limited, manufacturing chemists, has left a contingent legacy of £35,000 to the University of Birmingham for the provision of scholarships for boys and girls of the industrial classes whose parents' weekly wage does not exceed 50s. and who are desirous of entering the medical profession. "In my opinion," the testator says, "there are potentialities of the born doctor being found among such children, in which case it would be in the interest of medical and surgical science, also the benefit of humanity." Each scholarship will be of the annual value of £100, tenable for five years. It is a little unfortunate that the testator should have named the maximum income-limit in terms of money, the purchasing power of which has diminished by one-half or more since the bequest was made. This will exclude from the benefit many of those who would be most likely to benefit by it.

THE CULT OF THE SCRUBBING-BRUSH.

To the Editor of THE LANCET.

SIR,—The A.Y.Z. bucket, scrubbing-brush, and mop form a complete answer to the question of "A Hospital Physician." The objection of the scrubbers to the old-fashioned mop is based on the difficulty of getting it (1) hard enough to remove the dirt, and (2) dry enough to remove the dirty water on the floor. The A.Y.Z. scrubbing-brush has a long handle and is dipped into the bucket of soap and water as required. The bucket has a perforated cup-like attachment inside, near the top, and the mop is first twisted round and then pressed into it to express the water. The bucket has proved a friend in need to many a stranded housewife. It can be obtained at the stores.

I am, Sir, yours faithfully,

DOCTOR'S WIFE AND LATE HOSPITAL SISTER.

A PORTABLE CINEMATOGRAPH.

THERE are obvious uses for a portable cinematograph in medical work. As a means of demonstration in clinics and in surgery it should have decided educational value. Occupying no more space than an ordinary dressing-case, the De Vry Projector will project an 8-ft. picture at a distance of 40 ft. The actual dimensions of the type C-90-100 to 110 volts D.C., a specimen of which was shown us in this office, are 17×17×7 inches over all, and the weight is 20 lb., motor drive. The price of this apparatus, complete and ready to operate, is £50. It is stated that the total current consumption does not exceed 500 watts, so it can be worked from the ordinary light socket. The focusing, framing, starting, motor drive, and illumination are controlled from the outside of the case, and the film is re-wound by the motor in the projector. A company known as British Instructional Films, Ltd., of Phœnix House, 19, 20, and 21, Oxford-street, London, W., retains a specialist in cinematography, who photographs any interesting scientific subjects presented to him for reproduction in the portable cinematograph machine. The field of its application in medicine and the collateral sciences may be wide and the results instructive.

A demonstration is taking place this week, at the Obstetrical Section of the Royal Society of Medicine, of motion pictures in normal labour.

T. O.—It is evidently unnecessary for every tuberculosis officer, every child-welfare medical officer, or every school medical officer to go through the ordinary full course of study prescribed for the diploma of public health. Many are doubtless prepared to remain specialists and to make a particular clinical branch of the public health service their career. But others enter these clinical services with the intention of ultimately proceeding to an appointment as medical officer of health, which carries with it greater responsibility and greater emolument.

Their Majesties the King and Queen have again been graciously pleased to show their interest in the work and welfare of the Great Northern Central Hospital by presenting bound volumes of the *Sporting and Dramatic News* for the benefit of the patients.

BOOKS, ETC., RECEIVED.

BUTTERWORTH AND CO., London and Calcutta.
A Manual of Conservancy. By Jahar Lal Das, L.M.S. With Introduction by Dr. C. A. Bentley. Pp. 190. Rs.5.10.
Painless Childbirth and Twilight Sleep. By C. Webb-Johnson, Captain, R.A.M.C.T. 2nd ed. Foreword by Comyns Berkeley, M.D. Pp. 169 and chart.

COLLINS, W., SONS, AND CO., London.
The Young Physician. By F. B. Young. Pp. 485. 7s.
Over and Above. By J. E. Gurdon. Pp. 250. 7s. 6d.
Madeleine: One of Love's Jansenists. By H. Mirrlees. Pp. 216. 7s.

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Two Clinical Lectures ON PROGNOSIS IN SURGERY.

Delivered at St. Bartholomew's Hospital on Oct. 8th and 15th, 1919,

BY SIR D'ARCY POWER, K.B.E., F.R.C.S. ENG.,
SURGEON TO THE HOSPITAL.

GENTLEMEN,—The patient whose case I now describe was fortunate in belying the fatal issue which I predicted for him, so I thought he would form a fitting introduction to some remarks on prognosis in surgery. He is 57 years of age, and had never suffered from any previous abdominal trouble. He went to bed on Friday, August 29th, in his usual health, and woke up on the following morning with a stomach-ache. He took a dose of Glauber's salt, and as his bowels did not act he took a second dose in the course of the day. The pain increased, he called in a doctor, who, not being altogether satisfied about his condition, asked me to see him on Sunday afternoon, although the patient himself made light of the matter and said it was only a passing attack of constipation. I found him sitting up in bed and moving easily. His temperature was 100 6° F., and his pulse 80. The abdomen was rigid in the right lower quadrant, and there was marked tenderness in the right iliac region. I told his wife that the patient was seriously ill, for his appendix was inflamed and had probably mortified, and recommended that she should take him at once to the hospital. She took my advice, and within two hours I was operating upon him. The appendix was gangrenous at the base, the distal two-thirds being fairly healthy, but it was so adherent to the surrounding tissues that I was unable to free it. I therefore cut it across, disinfected it, and dropped the lower third back into the abdomen. The rest of the appendix was removed up to the cæcum and the wound was drained. A fæcal fistula formed within a few days, closed spontaneously, and the patient is now nearly ready for discharge and able to answer any questions. He is, as you see, a fat man; he had a gangrenous appendix, of which only a portion could be removed, and there was a collection of stinking pus. I gave a very grave prognosis, for I thought the patient would die. Thanks to his own powers of resistance and skilful nursing he has recovered.

ACCURATE PROGNOSIS.

Much of your reputation in practice will depend upon the skill with which you can forecast what is going to happen to your patient. This skill is difficult to acquire. You may quickly prove yourselves deft operators or most resourceful in the treatment of symptoms, but if you cannot foresee how a patient will progress or from what disabilities he is likely to suffer after an injury you will sustain some rude shocks and will fall in the estimation of the friends of the patient when the unexpected happens. Accurate diagnosis and a sound knowledge of pathology aided by experience are the bases upon which prognosis is built up; but even then prognosis is often falsified, for we have to confess with Heinsius, "Quantum est quod nescimus." Still, you may learn much from us if you will ask what we expect to happen to the various patients for whom you are acting as dressers in the wards. With an accurate prognosis you will be able to warn the friends in cases where death is impending, for there are very few causes of sudden death after an operation—indeed, the only one I can recall which is a real catastrophe is due to embolism—in all others the alert practitioner is able to give some warning of the calamity, whilst after injury the patient is often thankful to be told the degree and duration of any disability from which he is likely to suffer. He is, too, much more amenable to the restrictions imposed if an intelligent reason can be given for keeping him in bed or for prohibiting what seems to him to be some harmless action. In the particular case of appendicitis used as a text, I expected that the patient would have developed a general suppurative peritonitis with increasing abdominal distension, sloughing of the abdominal wound, and that he would have died from failure of the heart's action within a week.

Recovery the Rule after Early Operation.

The gravity of the prognosis in cases of appendicitis—even in the most acute forms—is often over-estimated. Recovery is now the rule in most of the patients who have been operated upon within 72 hours of the onset of symptoms, and if the patient survives the first two or three days after operation for a general peritonitis he usually recovers, although the convalescence may be very prolonged. Pain, sleeplessness, and a continued rapid pulse are of bad omen after an operation for suppurative peritonitis. Do not treat these symptoms, but make a determined attempt to discover the cause. The pain is probably due to an extension of the inflammation involving the parietal peritoneum; the drainage is insufficient or a fresh abscess is being formed; the sleeplessness and quick pulse are evidences of septic absorption. If you mask the pain by fomenting the wound and procure sleep with hypnotics you may find the patient dead when you have been prophesying recovery. If these symptoms only last for a day or two after the operation you will find that they disappear very rapidly after the formation of a fæcal fistula. I used to view fæcal fistulæ with apprehension until I reflected that before they were formed the intestine must have contracted sufficient adhesions to shut it off from the general peritoneal cavity. They now seem to me to be of the nature of a safety-valve. They usually close as readily as they form, and I do not remember any case where I have been called upon to close such an opening by operation.

Sequelæ of Appendicitis.

As regards other sequelæ of appendicitis which may influence your prognosis, you should remember that every abdominal operation leaves a sense of stiffness and weakness, the patient complaining that he cannot keep himself upright. This passes off in a short time, and if the scar is satisfactory he soon gets about as usual. The scar of the operation wound after prolonged drainage is often weak; there may be a ventral hernia, or the patient may suffer from that form of discomfort which is attributed to the formation of "adhesions." We rarely see a working man complain of adhesions, but the symptoms are apt to be exaggerated in the neurotic. Do not forget, too, that when silk has been used and the wound has suppurated a sinus may be formed a long time after the scar has appeared to be soundly healed, much to the alarm of the patient, until he is told that it will close quickly as soon as the piece of infected silk has been removed or discharged.

Time an Important Factor.

Time plays an important part in the prognosis of most acute abdominal conditions requiring surgical interference, and in none more than in perforation of the stomach and duodenum, in internal strangulation of the bowel, and in volvulus. Operations for their relief completed within the first 12 hours are usually successful. Your difficulty lies in the fact that you have not the courage of your opinions. You make a diagnosis and are then afraid to act upon it. You wait to see whether the patient will improve—he rallies from the initial shock; you are thereby deceived, and you let the precious hours slip by until the onset of undoubted peritonitis confirms your diagnosis, but too late for an operation to be useful. Although the prognosis is favourable in the majority of cases of acute perforation which have been operated upon early, it is distinctly unfavourable in the drink-sodden however soon they are operated upon, and I am never satisfied as to the recovery of such persons unless the pulse resumes its natural rate, and they have lived through the first ten days. They often seem surprisingly well, until they die suddenly about the end of the first week.

Volvulus and strangulation of the bowel by a band both have a grave prognosis, not because they are serious in themselves, but because they are of rare occurrence, and the diagnosis is consequently too often delayed until the injury to the bowel has become irreparable. The earlier the operation the better the prognosis, but as the bowel has great powers of repair an operation should be performed even when there is well-marked tympanites and when there has been much vomiting.

Street Accidents.

I view with grave suspicion all street accidents when there is collapse with the history of abdominal injury without obvious external sign. When the bowel has been ruptured by such an accident there is often a fallacious calm due to the temporary arrest of intestinal peristalsis. The prognosis in all such cases should be of the most guarded character. Some of you may remember the case of a boy

we had in the hospital who was admitted with a fractured pelvis after he had been run over by an omnibus. His abdomen was tender but he slept well; on the following day he ate well and had a second good night, though his abdomen was still tender and was slightly rigid. On the third day the distension increased, and on exploration the small intestine was found to be ruptured in the right iliac fossa and the peritoneum was acutely inflamed. The prognosis in rupture of the spleen is better in my experience than in laceration of the liver. The collapse is severe, but the operation of removal is easy and can be completed quickly, so I embark upon it with comparative confidence as soon as possible after the injury.

Cerebral Concussion.

As regards head injuries my colleague, Mr. L. B. Rawling, teaches us that the longer the period of primary concussion the more serious is the intracranial damage. But you must be careful not to give too sanguine a prognosis in cases of cerebral concussion even if the symptoms have been very slight and transient. Mr. Rawling tells us, too, that the first definite signs of intracranial pressure are slowing of the pulse, increasing blood pressure, and headache. When these symptoms are present after an injury to the head, recommend operation; do not wait until an increasing pulse-rate, a falling blood pressure, and stertorous breathing show that the medullary centres are becoming paralysed. Remember that about 50 per cent. of patients die after fracture of the base of the skull, and that of those who recover probably not more than half regain their faculties completely.

Just a word or two about children. The prognosis in cases of acute intussusception has improved very greatly as a result of early operation. The mortality was formerly nearly 100 per cent.; we now have long series of cases without a death. The prognosis in burns and scalds, to which the children of the poor are especially liable, is exactly the reverse: a very large proportion of such children die. They are either brought to the hospital moribund or they soon succumb to their injuries in spite of all that can be done for them.

PROBLEMS CONNECTED WITH THE AFTER-STATE OF PATIENTS.

Turning now from the prognosis as regards life to the after-state of a patient who has sustained an injury, I would draw your attention to this patient, a man of 57, who is in business in the City and was brought into the hospital seriously hurt as the result of a street accident. He has sustained a simple fracture of the right humerus, of the pelvis, and of the femur. He has also a compound comminuted fracture of the right tibia and fibula. The simple fractures are matters of comparatively small importance for him. The compound fracture of the leg is more grave. I told him the other day that it would be a long time before he could return to his business, and that he would then have a stiff ankle, with some deformity of the leg, which would oblige him to walk with a stick. Looking to the future, I suggested that if it was important for him to return to work as quickly as possible he would do well to let me amputate his leg in the lower third. He replied that he would rather wait, as his son, who had just been demobilised, could carry on the business, but if at any time his life was endangered by waiting he would have his leg removed. He is in good general health, he will be well nursed, and his mind is at rest. I have no doubt, therefore, that he will leave the hospital in some months' time, after several large sequestra have been removed from the tibia, with a maimed, but fairly useful, foot.

Cases to be Considered Individually.

These are the problems which you will have to solve in practice. Each case must be considered individually according to the circumstances of the patient. To a manual labourer a fracture of both bones of the leg means ruin, for he loses his work at once and on leaving the hospital he finds himself permanently amongst the unemployed. There are some occupations, like those of a dancing master or a professional dancer, to whom even a simple Pott's fracture is a much more serious matter than to the ordinary person on account of the flat-foot which is so often associated with the injury. Every care, therefore, must be taken during treatment to see that the arch of the foot is preserved. The patient, too, must be prevented from bearing weight on his leg at too early a period after the injury, for there is a great tendency for the outward displacement of the foot to recur in patients who have been allowed to return to work before the fracture has become firmly consolidated.

The patient has also sustained a simple fracture of the femur. We used to be contented if repair took place after this accident with a slight degree of shortening. Our ideal has changed during the last few years, and we now aim at repair without any shortening at all, or even with a slight lengthening of the broken bone. This gain is a very real advantage. It is obtained by careful attention to detail, a very prolonged course of treatment, but unless you are careful there remains a troublesome stiffness of the knee.

The prognosis after fracture of the shaft of the femur, therefore, is extremely good, whether the fracture be simple or compound, if the patient will give the time and the practitioner the patience to get a perfect result. It is far otherwise in old people who fracture the neck of the femur with slight violence. The prognosis in these cases is usually grave, and it is often difficult to persuade the friends that an accident apparently so trifling may be followed by such serious results.

Bear in mind that a transverse fracture of the patella does not necessarily mean a useless knee, even if it be not "wired" and union by fibrous tissue is allowed to take place instead of the bony union which is the ideal to be aimed at. You will meet with many patients upon whom it is undesirable to perform an operation. "Wiring" fractures of the patella is so recent a method of treatment that many of us recollect, when fibrous union was the rule, that the patients were able to follow their occupations of postmen and omnibus conductors with tolerable facility although there was a wide gap between the two fragments.

X RAYS IN PROGNOSIS.

In all injuries correct diagnosis is the key to accurate prognosis, and this is nowhere better exemplified than in those injuries of the carpus which are treated as sprains but are in reality fractures of one or other of the carpal bones, fractures of the scaphoid and semilunar being the most common. If a sprained wrist does not respond to treatment in a reasonable time a skiagram should be taken, especial attention being paid to the lower end of the radius, the carpal bones, and the base of the metacarpal bone of the thumb. The prognosis will depend upon the X ray findings, and can often be improved by operation. If you wait until there is a chronic synovitis and evidence of arthritis the prognosis is bad. Fracture of the lower end of the radius has a good prognosis in young people; a bad prognosis in old persons, in whom it nearly always leaves some permanent stiffness of the wrist.

CONCLUSION.

There are many other points in prognosis to which your attention might be directed did time allow. My object in bringing the subject under your notice is to incite you to a closer study of this important branch of surgery. You are too apt to content yourselves with watching the patients from day to day and taking no thought for the morrow. You ought to know whether a patient will live or die; you should try to foresee the disabilities from which he is likely to suffer after various injuries, for you will then be able to give him timely advice, and by foreseeing you may sometimes do much to prevent them. Some of us are credited with an uncanny gift in both respects, but it is merely the result of experience; for we are not really like the youngest son in the fairy tale, who won the princess by his skill in prognosis.

THE LATE MR. SKAIFE.—The death occurred at Chichester on Oct. 23rd of Mr. Frederic Skaife. Educated at St. Bartholomew's Hospital, he took the L.S.A. diploma in 1871, and proceeded to the L.R.C.P. Edin. and M.R.C.S. He settled at Chichester shortly afterwards, where he soon gained an extensive practice, and was for very many years on the medical staff of the Royal West Sussex Hospital. The death of a son, Captain Arthur Skaife, 1st Battalion, Middlesex Regiment, in the early days of the Great War, was a great blow to him, as was the news of the death of his elder son, Lieutenant-Colonel E. O. Skaife, Royal Welsh Fusiliers. This information happily turned out to be untrue, although Colonel Skaife had been wounded and was a prisoner of war. Early this year the toll of years began to tell on Mr. Skaife and owing to failing health he retired in March from practice, to the regret of a large circle of patients and friends.

THE WEIL-FELIX REACTION IN A MILD EPIDEMIC OF TYPHUS

OCCURRING AMONGST A TYPHUS-RIDDEN PEOPLE.

BY L. E. NAPIER, M.R.C.S. ENG., L.R.C.P. LOND.,
LATE CAPTAIN, R.A.M.C., T.C.; BACTERIOLOGIST TO NO. 12 INDIAN GENERAL HOSPITAL, MESOPOTAMIA.

AN epidemic of a modified type of typhus occurred in the Armenian refugee camp which is situated at Baqubah, about 30 miles south-east of Baghdad. There were about 50,000 refugees in the camp—men, women, and children. The first cases were diagnosed late in November of last year, but it is probable that a number of earlier cases were missed as none of us were familiar with this mild form of the disease. At the beginning of April, when I left Baqubah, there were very few fresh cases occurring.

During this period, roughly four months, the admissions to, and the deaths in, the isolation hospital of typhus cases were as follows (Table I.):—

TABLE I.

Refugees.	Admissions.	Deaths.	*Others.*	Admissions.	Deaths.
Men	30	4	British officers ...	1	1
Women	58	3	,, other ranks	4	1
Children	14	0	Indian ,, ,,	2	1
Total	102	7	Total	7	3*

* Died in Baghdad Isolation Hospital.

Thus it will be seen that whereas amongst the refugees the mortality was only about 7 per cent., amongst the others it was as high as 43 per cent. The high percentage of the latter may be due to chance as the numbers on which it is based are so small. If one may be permitted for the moment to draw conclusions on an insufficient basis the explanation that suggests itself for the difference in these two percentages is that we were dealing not with a mild strain of the disease but with an ordinary strain, occurring on the one hand amongst a partially immune population, the refugees, and on the other amongst a highly susceptible one. From conversations with the more intelligent of the refugees we gathered that typhus was more or less endemic in their own countries.

The Course of the Disease.

The disease differed from the text-book typhus principally in the lack of severity of the symptoms. The patients seldom "reported sick" until they had been ill for about five days, and frequently later. The rash appeared about the fifth, sixth, or seventh day, and the temperature fell by crisis on the fourteenth, fifteenth, or sixteenth day of the disease.

Towards the end of December Lieutenant-Colonel J. C. G. Ledingham, who was the consulting bacteriologist to the Mesopotamian Expeditionary Force, sent us a "proteus-like" organism, labelled X 19, together with a short résumé of the literature on the subject of the Weil-Felix reaction, and suggested that we should apply the test to some of the cases at Baqubah. We noticed that this organism differed in its biochemical reactions from the organism described in some of the literature. It gave acid only in glucose and saccharose with no change in lactose, mannite, and dulcite. The liquefaction of gelatin was very marked.

Technique.

At first we used both living and dead cultures, performing each test in duplicate, but we soon discarded the living cultures, as there appeared to be little advantage in them, and their use entailed repeated standardisation. All the results recorded below are with killed emulsions. A 24 hours' growth on agar was scraped off into a 0·5 per cent. solution of carbolic acid in normal saline. This emulsion was heated to 56° C. for two hours and standardised to contain 2000 million organisms per c.cm. All the tests were carried out with one "brew" of the emulsion, which was frequently tested against a standard serum to ascertain that its agglutinability had not decreased. The test was performed by Wright's method with capillary pipettes. The final reading was taken after 18 hours at room temperature.

Two sets of controls were done, one with the blood of normal refugees and the other with that of refugees in hospital with diseases other than typhus.

Control: Group I.

A specimen of blood was taken from each of 50 refugees—men, women, and children—who had come up for vaccination and who gave no history of having been in hospital since they had been in Baqubah—that is to say, at least six months—or of having been ill during this period. These were put up against an emulsion of X 19 in dilutions of 1 in 10 upwards. In no case was there any agglutination in a dilution of 1 in 320. The specimens grouped themselves as follows (Table II.):—

TABLE II.

Group.	No. of specimens.	Dilutions. 1 in 10.	1 in 20.	1 in 40.	1 in 80.	1 in 160.
1	14	–	–	–	–	–
2	9	+	–	–	–	–
3	20	+	+	–	–	–
4	5	+	+	+	–	–
5	1	+	+	+	+	–
6		+	+	+	+	+

The test was repeated with the seven specimens of the last three groups, but dilutions of 1 in 50, 100, and 200 were taken on this occasion. (Table III.)

TABLE III.

Group.	No. of specimens.	Dilutions. 1 in 50.	1 in 100.	1 in 200.
a.	3	–	–	–
b.	3	+	–	–
c.	1	+	+	–

That is to say, that of the 50 specimens taken from normal refugees, only one gave agglutination in a dilution of 1 in 100, and four gave agglutination in a dilution of 1 in 50. Therefore, for diagnostic purposes, it is of little value to start with a dilution lower than 1 in 50.

Sex appeared to have no influence on the result, but there was a distinct tendency for the titre to vary in direct ratio to the age of the individual. Thus: Of those aged 15 and under, of 29 specimens the average titre reached was 1 in 11·38; and of those aged 16 to 37, inclusive, of 20 specimens the average titre was 1 in 22. The other specimen, from a man aged 40, gave a titre of 1 in 160. The figures are not large enough to draw any conclusions from this, but it appeared to be a fact worth noting.

Control: Group II.

Twenty-four cases suffering from febrile conditions totally incompatible with a diagnosis of typhus, and 3 other hospital cases. (Table IV.)

In the first eight cases the specimens were sent to the laboratory for the Weil-Felix test, as it was thought that they might possibly be cases of typhus. The other specimens were either sent by our request as controls, or the blood was sent to the laboratory for some other purpose, such as a Widal. Only in the last four cases was the serum tested in a lower dilution than 1 in 50.

Thus, of the 24 cases suffering from a febrile condition, not typhus,

2 cases gave agglutination in a dilution of 1 in 100,
8 cases ,, ,, ,, ,, of 1 in 50;

or, excluding the four cases of typhoid,

No case gave agglutination in a dilution of 1 in 100,
5 cases ,, ,, ,, ,, of 1 in 50.

Comparing the results of these two sets of controls, there is some evidence that the agglutinability of the blood for this particular organism is increased to a slight extent in any febrile condition, but that this increase is quite marked in the case of typhoid fever. The reverse is also true; that is to say, the blood of a patient suffering from typhus will usually agglutinate *B. typhosus* in a dilution of 1 in 50, and often in 1 in 100.

We commenced a third set of controls with the blood from a normal population (i.e., hospital staff, &c.). This, however, was cut short by a sudden spell of hot weather which spoilt

TABLE IV.

Name.	Day of disease.	Highest dilution in which agglut. occurred.	Disease.
Case "A."	5th 7th	1 in 50 50	Malaria.
,, "C."	4th 10th	0 0	Lobar pneumonia.
,, "D."	7th	0	Relapsing fever.
,, "E."	8th	0	N Y.D. fever.
Lo. Sh. ...	8th	1 in 50	Lobar pneumonia (died).
Ma. Mu. ...	5th	1 in 50	Relapsing fever.
Mo. Jo. ...	7th 14th	0 0	N.Y.D. continued fever.
V. Ca. ...	9th	0	N.Y.D. fever.
A. Ma. ...	17th 30th	0 0	N.Y.D. continued fever.
Case "G."	16th	0	N.Y.D. fever.
Ap. La. ...	19th	0	N.Y.D. continued fever.
S. Sh. ...	19th	0	,, ,,
Os. Ka. ...	18th	1 in 50	,, ,,
A. Wa. ...	20th	0	,, ,,
Ma. Kh. ...	17th	0	,, ,,
K. So. ...	19th	0	,, ,,
B. Ya. ...	17th	0	Paratyphoid B.
Ma.	20th	0	Paratyphoid A.
K. Kh. ...	14th 19th	0 1 in 50	,, ,,
Mi. Ja. ...	16th	0	Typhoid Widal positive 1/2000.
La. Ab. ...	12th 18th	1 in 50 0	Typhoid Widal 1/100. Typhoid Widal 1/1000.
Y. Sh. ...	20th	1 in 100	Typhoid.
Ge. Is. ...	16th	1 in 100	,,
Sh Ma. ...	6th	1 in 20	N.Y.D. fever.
Ma. Oh. ...	?	1 in 20	Convalescent dysentery.
V. Pe. ..	?	1 in 20	,, ,,
Mi. Ov. ...	?	1 in 20	Conjunctivitis.

both our emulsion and standard serum, the laboratory being in a tent and no ice being available. The few specimens that we tested gave no agglutination in a dilution of 1 in 20 We made no further effort to carry out this control, as it will almost certainly have been done elsewhere.

Definite Cases: Group I.

The following table shows the results obtained from specimens from 40 patients in the isolation hospital. All these were clinically typical cases of typhus, of the mild type which was prevalent in Baqubah, and in no case did the diagnosis depend on the result of the Weil-Felix reaction (Table V.).

TABLE V.

Name.	Day of disease.	Highest dilution in which agglut. occurred.	Name.	Day of disease.	Highest dilution in which agglut. occurred.
Ma. Y. ...	7th	1 in 2,500	N. Tu. ...	14th	1 in 3,200
Sa. Is. (a)	8th	1 in 200	V. Se. ...	14th	1 in 3 200
Sh. Y. ...	8th	1 in 5 000	M. Sa. ...	15th	1 in 4,000
W. Ba. (b)	8th	1 in 20,000	S. Is. ...	16th	1 in 10,000
Na. S. (c)	8th	1 in 10,000	Y. Ja. ...	17th	1 in 10,000
A. Ca. ...	9th	1 in 10,000	N. Ba. ...	19th	1 in 10,000
Ra. G. ...	10th	1 in 1,250	N. Ab. ...	20th	1 in 1,000
Is. K. ...	10th	1 in 2,500	Fr. Se. ...	20th	1 in 10,000
Kh. S. ...	10th	1 in 1,600	M. Se.† ...	20th	1 in 800
Sh. (d) ...	10th	1 in 5,000	Ya.	20th	1 in 10,000
Os. Me.*	10th	1 in 800	Va.	20th	1 in 3,200
Ma. Ba. (e)	10th	1 in 800	So. A. ...	21st	1 in 10,000
Ma. Oh. .	10th	1 in 3,200	R. Jo. ...	21st	1 in 2,500
Ma. W. (f)	10th	1 in 400	Ma. Be. ...	21st	1 in 3,200
G. Da.† ...	11th	1 in 1,250	R. Be. ...	23rd	1 in 640
An. Ja. ...	12th	1 in 10,000	Y. Yo. ...	23rd	1 in 800
G. Ky.† ...	12th	1 in 800	Ss. Ba. ...	24th	1 in 1,600
M. Os. ...	14 h	1 in 4,000	M. Ar. ...	24th	1 in 5,000
A. Pa. ...	14th	1 in 10,000	T. Jo. ...	25th	1 in 1,000
Ko. M † ...	14th	1 in 800	Y. Ba. ...	30th	1 in 3,200

* Very old man. † Child.

Subsequent results—(a) 19th day, 1/10.000. (b) 17 h day, 1/5000. (c) 17th day, 1/1 .500. (d) 30th day, 1/2000. (e) 21st day, 1/1600. (f) 21st day, 1/800.

Definite Cases: Group II.

Specimens were sent to the laboratory from the following 11 cases, either to confirm the diagnosis, or by a sceptical medical officer who did not believe in our ability to make a diagnosis in the laboratory without first seeing the case (Cases "B" and "F"). All these were eventually clinically unmistakable cases of typhus, and were treated as such, but as the result of the Weil-Felix test possibly influenced the diagnosis they are placed in a separate table. (Table VI.)

TABLE VI.

Name.	Day of disease.	Highest dilution in which agglut. occurred.	Name.	Day of disease.	Highest dilution in which agglut. occurred.
Ma. Ma.*...	5th 7th	1 in 50 800	Or. Os. ...	8th 10th	1 in 200 800
Jo.*	5th 8th 12th 16th 22nd	1 in 100 800 5,000 5,000 3,200		15th 17 h 21st	5,000 3 200 3,200
			O. Ka. ...	8th	1 in 3,200
			Case "F."	9th 12th	1 in 400 20,000
Mi. Ba.* ...	5th 10th 20th 26th	1 in 3,200 10,000 10,000 12,500	Ka. Ac. ...	9th 16th 18th 25th	1 in 10,000 20 000 12 500 1,600
Pa. Sh.* ...	6th 20th 26th	1 in 3,200 5,000 3,200		27th	1,600
			Case "B."	14th	1 in 10 000
Na. Ma. ...	8th 9th 11th 15th 18th 20th 25th	1 in 400 800 3,200 3,200 3,200 3,200 3,200	Mi. Ya.† ...	15th 19th 22nd 29th	1 in 400 800 400 100

* Rash on 6th day.

† Mild case. Rash and temperature chart typical, but never ill.

It was very unfortunate that we were not able to obtain the blood earlier than the fifth day, and only in three cases as early as this. It will be noted that in two of the four cases in which the blood was taken before the rash developed the titre obtained was quite high, but in the first two cases a laboratory diagnosis could not have been made on the result of the first test, although the markedly increased titre on the seventh and eighth days respectively put the diagnosis beyond doubt.

As the height of the titre varies so much with the individual, and as comparatively few specimens were taken from each, it is impossible to obtain anything but a very irregular graph showing the relation between the titre and the day of the disease of the whole of the observations. The day of disease given is only the "probable" day, and as histories were somewhat vague it would be quite fair to assume that the "possible" days of disease in each case were the day itself and the two days directly before and after it. Thus, in plotting the graph for the twelfth day of disease, for instance, we have taken the average of all the titres obtained on the eleventh, twelfth, and thirteenth days.

FIG. 1.

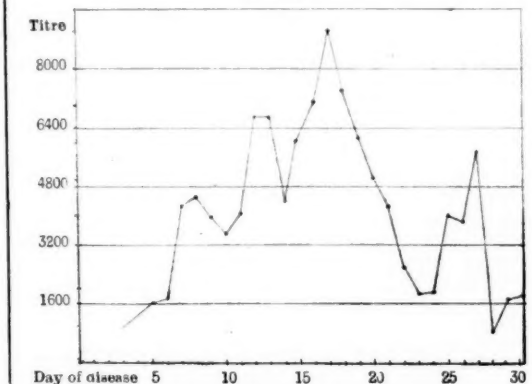


Fig. 1 is a graph showing the relation between the "possible" day of disease and the highest titre reached on that day of the whole of the 85 specimens from definite cases.

Doubtful Cases: Group I.

Three cases which were being treated as typhus in the isolation hospital but in which the disease ran an atypical course.

Name.	Day of disease.	Highest dilution in which agglut. occurred.	Remarks.
As. Jo....	10th 22nd 30th	1 in 50 200 200	Temp. fell by lysis on about 14th day. She had a thrombosis subsequently. Widal, Para. B. 1,800 +.
A. Sa. ...	14th 26th	1 in 400 400	Temp. only for few days. No rash. Diagnosis due to positive Weil-Felix 12th day, 1 in 320.
Na. Da.	20th 25th	1 in 1,600 800	Female child, aged 6. 14 days irreg. temp. Mother suffering typhus.

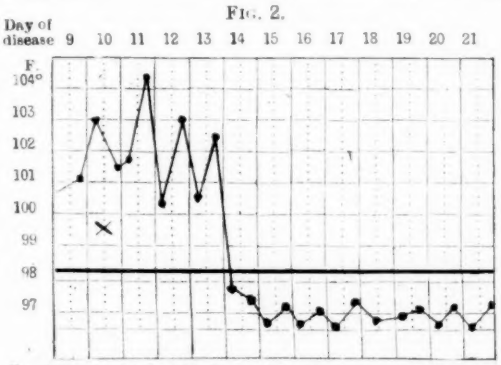
The first two cases are probably not typhus, and should therefore possibly have been included in our control, Group II. The high titre reached may have been due to a comparatively recent attack of typhus. Had the diagnosis depended on the results of the Weil-Felix reaction the first case would not have been diagnosed typhus, as in none of the 51 definite cases was so low a titre obtained on the tenth day. The positive Widal did not appear until the twenty-second day. Again, in the second case 1 in 400 is an exceptionally low titre for the fourteenth day, and one would have expected a markedly diminished titre by the twenty sixth day. The third case is probably just a clinically atypical case of typhus occurring in a child.

Doubtful Cases: Group II.

Seven cases not diagnosed as typhus, the notes and temperature charts of which were very suggestive of the disease and in which no other definite diagnosis was made.

Name.	Day of disease.	Highest dilution in which agglut. occurred.	Remarks.
El. Ja. ...	10th	1 in 1,600	Typ. chart. Temp. fell 14th day.
Th. Ja....	9th	1 in 2,500	Ditto. Rash.
B. Al. ...	12th	1 in 5,000	Typ. chart. Temp. fell 15th day. Rash.
Ja. Th. ...	10th	1 in 5,000	Ditto.
Sh. In. ...	10th 30th	1 in 400 1,600	Ditto.
Oh. A. ...	6th 10th	1 in 1,600 10,000	Temp. fell by lysis 13th day. History of rash.
Ab. Is. ...	10th 15th 22nd 30th	1 in 640 800 400 400	Clinically paratyphoid but Widal not conclusive. Temp. fell by lysis 14th day.

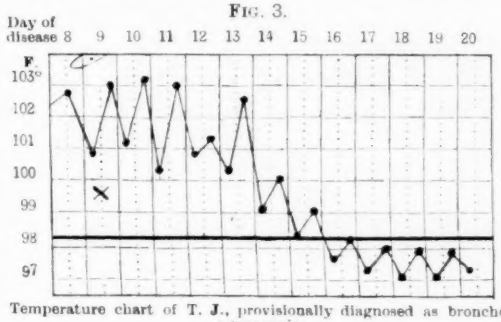
FIG. 2.



Temperature chart of H. J., provisionally diagnosed as broncho-pneumonia. At X Widal and Weil-Felix tests were taken.

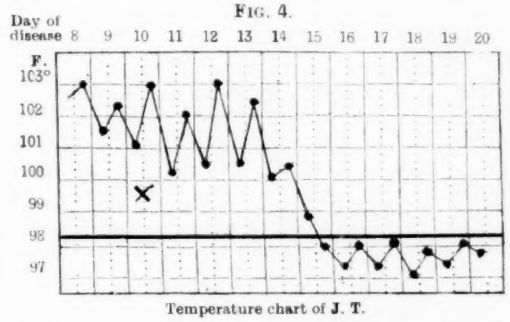
In these cases the blood was sent to the laboratory for a Widal. The result was negative except in the fifth and seventh cases; in these it was positive to typhoid at 1 in 50 and 1 in 100 respectively, and then only on the first occasion. In all the cases the blood was put aside after the Widal had been done, and the Weil-Felix was not done for some days, they were therefore not diagnosed as typhus at the time. When, however, the charts and notes were examined it was quite obvious that the first five had been cases of typhus, and that, although the notes and temperature charts of the last two were not quite typical, their clinical condition had been compatible with a diagnosis of typhus. Serologically, all these cases are typhus, the last being the only one in which there is any room for doubt.

FIG. 3.



Temperature chart of T. J., provisionally diagnosed as broncho-pneumonia.

FIG. 4.



Temperature chart of J. T.

Figs. 2, 3, and 4 are the temperature charts of the first, second, and fourth cases, respectively, of this group.

Discussion on Results.

Although an extraordinarily interesting reaction and of very definite value for purposes of diagnosis, the Weil-Felix reaction will still have to be classed, with the Widal, as an aid to diagnosis only. From the fact that a positive result in a dilution of 1 in 50 is given by 8 per cent. of normal refugees, 25 per cent. of patients with fever other than typhus and typhoid and in nearly every case of typhoid fever, it is obviously unsafe to make a positive diagnosis unless a higher titre than this is obtained. It is very exceptional to get any agglutination in a dilution of 1 in 100 except in cases of typhus and typhoid; so that, if one can exclude the latter, one can with comparative safety regard a case that gives agglutination in this dilution within the first six days of the disease as one of typhus. However, as in the Widal reaction, the most reliable points in diagnosis are the increasing titre in the early and the decreasing titre in the later stages of the disease.

Comparing this reaction in the diagnosis of typhus with the Widal in the diagnosis of typhoid, the former has two distinct advantages: (1) a positive reaction can be obtained at an earlier date; and (2) agglutination occurs in much higher dilutions. Of 59 cases, including 8 cases which were classified as doubtful, only 12 failed to cause agglutination in a dilution of 1 in 1600, and of these only 2 were adults who were tested at a period of the disease when one would expect to find a high agglutinating power in the blood—that is to say, between the tenth and twentieth days of the disease. None of the 59 probable typhus cases failed to give agglutination in a dilution of 1 in 640, and of the 77 control and 2 probable non-typhus cases, classified as doubtful, not one gave agglutination in a dilution of higher than 1 in 400, and only one in a dilution as high as this. Thus there is a very sharp line of distinction between the positive and negative results.

A disadvantage of the reaction is that in an ordinary severe case by the seventh day, the earliest day on which one can guarantee a definite result, the diagnosis, clinically, is usually beyond doubt. This, however, does not apply in the milder form of the disease, where the diagnosis is often in doubt until about the fifteenth day, when the temperature drops suddenly.

Our thanks are due to Captain W. Rees-Thomas, R.A.M.C. (T.C.), for much valuable assistance, and to Captain D. Craig, R A.M.C. (T.C.), who was in charge of the isolation hospital, for supplying us with most of the specimens and for allowing us free access at all times to his wards.

STUDIES ON THE WEIL-FELIX SEROLOGICAL TEST

FOR THE LABORATORY DIAGNOSIS OF TYPHUS FEVER.

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TOWARDS the close of 1918 and the beginning of 1919, during the typhus season in Syria, I had an opportunity of carrying out a number of blood tests on cases of acute typhus, from the point of view of the Weil-Felix reaction recently described in connexion with this disease.[1] The reaction, be it recalled, is an expression of the power often possessed and developed during the disease by the blood serum of the typhus patient, of specifically agglutinating in vitro a bacterial emulsion of *B. proteus* X 19. Although the studies with which this paper deals make no pretence at being exhaustive—which they could scarcely be, considering the "field conditions" under which they were carried out—still, in the confirmation which they afford of the constancy of the reaction in the disease, a short account of them may prove instructive. The contribution is merely a pioneer one.

Clinical Material and Technique.

Forty-seven blood tests were performed in all, on some 14 cases (British, Indian, and Turkish prisoners of war) of the disease, the tests ranging from the fourth to the thirty-fourth day of illness, and consequently covering the various stages of the disease from onset to convalescence.

To Captain William Forsyth, R.A.M.C., and to Captain K. B. Dickson, R.A.M.C., under whose clinical care these cases were, my best thanks are due for placing them at my disposal for the purpose of this investigation.

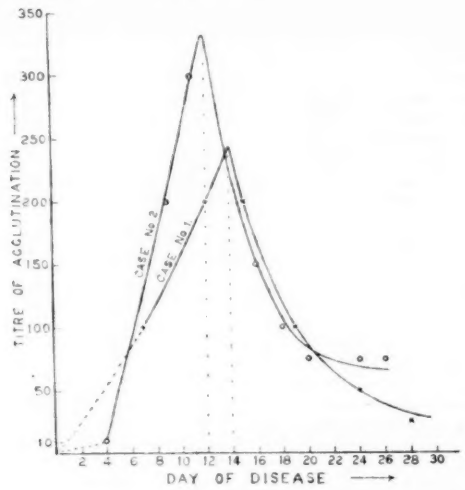
Blood from the patient's thumb was collected in a Wright's blood tube, and on arrival at the laboratory was centrifuged to separate off the serum. The agglutination titre of the latter was then determined towards a 10–12 thousand bacterial emulsion of *B. proteus* X 19 in saline phenolated to 0·5 per cent. The slide method of macroscopic agglutination associated with the names of Alcock[2] and Garrow[3] was employed, the results being read off after three minutes' rotation of the slide in the agglutinometer-box.

Experimental Findings.

The table here given briefly summarises the main features of the cases, and the results of the blood tests performed.

The table (columns 5 and 6) shows that these cases all, with the exception of Case 3, gave a markedly positive reaction from the first days of the disease, and that the strength of the reaction varied from day to day. Some idea of the nature of this variation is revealed by the accompanying diagram, which is a graphical representation of the findings for Cases 1 and 2.

The curves show that the Weil-Felix reaction in typhus fever steadily increases during the first fortnight to attain its maximum about the twelfth to fourteenth day of the disease (the period when, in the uncomplicated case, the temperature, as a rule, falls by crisis), to decrease rapidly thereafter during the period of convalescence. This finding indicates to what extent, other things being equal, the Weil-Felix reaction may render conspicuous service to the physician. It points to the conclusion that in an early case of doubtful pyrexia, which shows a positive Weil-Felix reaction steadily rising in the 24 hours, there is strong presumptive evidence of typhus fever.



No. of case and name.	Nationality.	Date in 1919 of blood specimen.	Rash.	Day of illness (patient's statement).	Result of agglutination test, for following dilutions of patient's serum. (Saline control: negative.) ½	1/10	1/50	1/100	1/500	1/1000	Date patient's temp. fell to normal.
1. S.	British.	1/1	Present	7	VM	VM	VM	D	–	–	5/1
		5/1		12	,,	,,	,,	VM	D	–	
		8/1		15	,,	,,	,,	,,	,,	–	
		12/1		19	,,	,,	,,	D	F	–	
		17/1		24	,,	,,	D	–	–	–	
		21/1		28	,,	,,	F	–	–	–	
		27/1		34	,,	,,	,,	–	–	–	
2. R.	,,	5/1	,,	4	,,	D	–	–	–	–	12/1
		8/1		7	,,	VM	VM	D	F	–	
		10/1		9	,,	,,	,,	VM	D	–	
		12/1		11	,,	,,	,,	,,	,,	F	
		17/1		16	,,	,,	,,	,,	F	–	
		19/1		18	,,	,,	,,	D	,,	–	
		21/1		20	,,	,,	,,	F	–	–	
		25/1		24	,,	,,	,,	,,	–	–	
		27/1		26	,,	,,	,,	,,	–	–	
3. H.	,,	8/1	,,	7	–	–	–	–	–	–	17/1
		10/1		9	–	–	–	–	–	–	
		12/1		11	–	–	–	–	–	–	
		17/1		16	VM	–	–	–	–	–	
		19/1		18	,,	F	–	–	–	–	
		22/1		21	D	–	–	–	–	–	
		27/1		26	,,	–	–	–	–	–	
4. Capt B.	,,	9/1	Absent.	4	,,	–	–	–	–	–	
		10/1	Present	5	VM	D	–	–	–	–	
		12/1		8	,,	VM	–	–	–	–	
5. S.R.	Turkish P. of W.	10/1	,,	5	,,	–	–	–	–	–	19/1
		15/1		10	,,	VM	F	–	–	–	
		23/1		14	,,	,,	–	–	–	–	
6. M.A.	,,	10/1	Absent.	4	,,	,,	–	–	–	–	19/1
		15/1	Present	9	,,	,,	VM	VM	–	–	
		23/1		17	,,	,,	D	–	–	–	
7. A.S.	,,	10/1	Absent.	4	,,	,,	–	–	–	–	21/1
		15/1	Present	9	,,	,,	VM	VM	–	–	
		23/1		17	,,	,,	D	–	–	–	
8. M.	British.	23/1		5	,,	D	–	–	–	–	
		25/1		7	,,	VM	F	–	–	–	
		27/1		9	,,	,,	D	–	–	–	
9. O.M. A.	Turkish P. of W.	10/1		10	,,	,,	VM	D	F	–	15/1
		23/1		23	,,	,,	F	–	–	–	
10. Y.S.	,,	10/1	Fading.	12	,,	,,	D	F	–	–	21/1
		23/1		25	,,	D	–	–	–	–	
11. M.H.	,,	10/1	Present	5	,,	VM	F	–	–	–	22/1
		23/1		18	,,	,,	–	–	–	–	
12. K.S.	Indian.	11/1		9	,,	,,	VM	D	–	–	11/1
13. R.R.	,,	12/1	,,	9	,,	D	–	–	–	–	
14. Y.M.	Turkish P. of W.	15/1	Present 4 days.	6	,,	VM	D	–	–	–	

VM = Agglutination very marked. D = Agglutination distinct to naked eye. F = Agglutination feeble, requiring hand-lens to be certain. – = Agglutination negative.

[1] R. Weil and A. Felix: Wien. Klin. Woch., xxi. (No. 2), 1916, 33–35.
[2] Broughton Alcock: Journ. R.A.M.C., xxx., 1918, 424–431.
[3] R. P. Garrow: THE LANCET, i., 1917, 262; Journ. R.A.M.C., xxviii., 1917, 566–572.

Case 3 appeared to us at first an exception (see tests of Jan. 8th, 10th, and 12th), there being no doubt clinically as to the diagnosis of typhus. This man's Weil-Felix reaction was persistently negative throughout the first fortnight, to become positive about the sixteenth day of the disease, when it was observed for the first time, his blood having then acquired the power to agglutinate markedly *B. proteus* X 19 in a serum dilution of 1/2, but not beyond. On the sixteenth day his temperature fell by crisis. A blood test 48 hours later revealed that the titre of agglutination, although still low, had increased slightly, being well marked in the 1/2 dilution and feebly so in the 1/10 dilution. Thereafter in his case, as in the others, this feebly positive Weil-Felix reaction, which might well have been missed on the method employed had it not been persistently studied in very low dilutions, gradually fell off, its maximum having been reached.

Of the 14 cases, then, of typhus fever tested by us 13 showed well-marked Weil-Felix reactions, and one gave such a feeble reaction that it might well have passed unperceived and been returned as negative.

Conclusion.

The significance of positive Weil-Felix reactions, other than the practical one that they may be utilised as a laboratory method for the diagnosis of typhus, is unknown.[4] As to that of such feebly positive reactions as the one above described—for no truly negative Weil-Felix reaction has been met with in any case of typhus examined by me—it may be that such reactions are related to the curious phenomenon, recently described by Nicolle and Lebailly,[5] of "inapparent infection." In the latter phenomenon, observed so far only in laboratory animals in connexion with experimental typhus, a guinea-pig occasionally shows no temperature reaction following inoculation with the virus of typhus, and yet its blood, at the time when the control animals show well-marked fever, is found to be virulent, especially for the African monkey. Rats, again, do not ordinarily react, even by an elevation of temperature, to the virus of typhus, but their blood is nevertheless virulent about the twelfth day.

These, then, are some, at least, of the problems connected with this interesting disease which it is for future investigation to solve.

OSTEITIS FIBROSA.

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THE condition known as osteitis fibrosa is now recognised to be a good deal commoner than was at one time supposed, but even at present some obscurity attaches to it, partly on account of the very mixed nomenclature under which it has been described and partly because it is still in many cases confused with, and described in conjunction with, several other entirely different diseases occurring in bone.

The fact that osteitis fibrosa frequently leads to cyst formation, and that the consequences of such cyst formation in bone are often the patient's reason for seeking advice, has led to a tendency to presume osteitis fibrosa as the cause of the cyst formation in such cases, often on inadequate evidence, and in many of the published cases the diagnosis is left as "cyst in bone" without any detail as to the underlying condition. That many such cysts in bone depend upon a cystic degeneration occurring in the course of osteitis fibrosa is undoubted, but, on the other hand, there is good reason to think that some of the other conditions leading to cyst formation—e.g., extreme degeneration of a myeloma, the so-called blood cyst, callus cyst, &c.—are less rare than some writers would have us believe. A further difficulty occurs in the fact that opinion appears to be still divided as to whether osteitis fibrosa, as it occurs in a single bone, and von Recklinghausen's multiple fibro-cystic disease of the bones are or are not identical conditions. The rarity of the latter and the lack of sufficiently long after-histories of the former make it difficult to hazard an opinion, but such evidence as there is would rather lead one to the belief that the two conditions are unconnected, excepting in so far as in both there occurs a localised or generalised replacement of the bone marrow by a fibroid tissue. I can find no case in the literature of the appearance of osteitis fibrosa in other bones after its operative treatment in any one bone. A case reported by V. P. Gibney of a cystic condition in the femur of a boy of 12, followed a year later by an apparently similar condition in the fibula of the same side, is anomalous in that both were operated on, and the pathological report on the condition in the fibula was "a chondroma with extensive calcareous areas and some cellular connective tissue," while in the case of the femur opinion was divided between osteitis fibrosa and "osteo-chondro-fibroma." Further, von Recklinghausen's disease occurs, as a rule, fairly late in life, while osteitis fibrosa is essentially a lesion of the epiphyseal period. In spite of the above-mentioned confusion sufficient data now exist to enable a fairly definite clinical and pathological picture of the condition known as osteitis fibrosa to be built up, and the satisfactory results that have followed its treatment by comparatively simple means make it desirable that it should be more often recognised in its earlier stages, and before its extension and complications have led to the production of considerable deformity.

Ætiology.

Many theories have been advanced to account for this condition since Virchow's original description of two cases which he regarded as the result of degeneration occurring in a chondroma. At the present time opinion is fairly evenly divided between the views that (1) it represents a metaplastic transformation of the bone marrow into a fibroid tissue, and (2) that it is the result of a chronic inflammation of unknown origin occurring in the endosteum. Whatever view is held as to its exact pathology, certain predisposing factors are fairly constantly present.

Trauma.—There is no definite evidence that trauma is of much importance as an ætiological factor, though in many cases the patient first has his attention drawn to the condition by the disproportionate results of comparatively slight accidents. It is by no means uncommon for a pathological fracture following some slight injury to be the first important symptom, and only on careful questioning are previous symptoms suggesting the condition brought to light. Bloodgood denies that trauma is in any sense a causative factor, but the predilection which osteitis fibrosa shows for the juxta-epiphyseal region of the bones, together with the importance of slight injuries in this region as a predisposing factor in other bone diseases, suggest that frequency of a history of trauma may have considerable significance.

The Influence of Sex and Age on the Condition.

Sex does not seem to influence the appearance of the condition. Age, on the other hand, has an important bearing, the great majority of the cases occurring before the twentieth year and the commonest age being about 12. The case from which the accompanying radiogram was taken is exceptional in that her age on presenting herself was 25, and in spite of the most careful questioning no suggestion of anything abnormal could be obtained in her history earlier than two years previously. Silver reports 97 cases, of which 75 occurred before the twentieth year and 22 after. These figures, however, are of little value, as many of the cases were undoubtedly cases of cysts occurring in sarcomata, chondromata, &c., and in many of the others there was no proof that the pathology of the cyst present was connected with osteitis fibrosa. In Bloodgood's 69 cases five only were over 20 years at the time of onset; but here again the pathology seems uncertain, especially in the group of cases in which a cyst only, with no lining membrane, and therefore no evidence of origin, was found. A. Tietze published a series of 24 cases, which appear to have more value in this respect in that they represent a group of definite cases of osteitis fibrosa. In these 24 cases, 20 patients were under 20 years of age and two were between 20 and 30; two were over 30 at the time when they came under observation, and in these it is noted as probable that the disease had already been present for a long time.

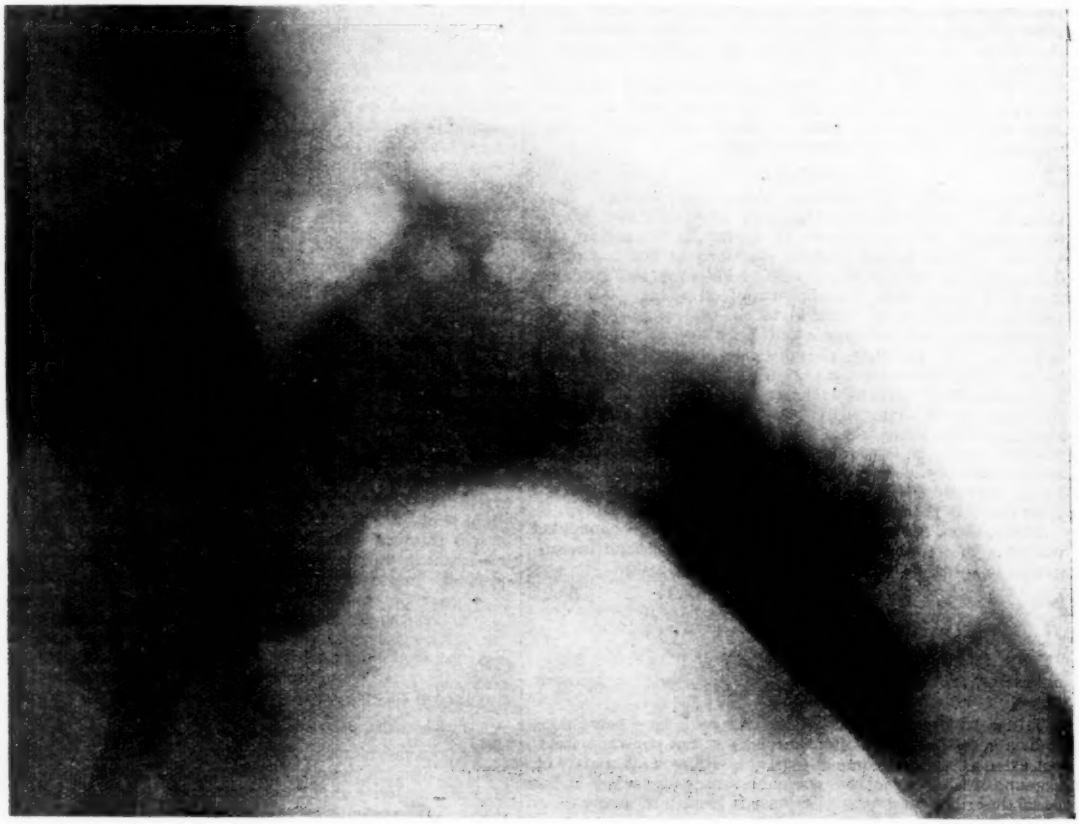
Bone Affected.

Three of the long bones of the skeleton seem particularly liable to this condition—namely, the femur, the humerus, and the tibia. Muller gives 38 per cent. in the femur, 22 per cent. in tibia, and 16 per cent. humerus. Bloodgood

[4] C. Craig and H. Fairley (THE LANCET, Sept. 28th, 1918, 386) view the Weil-Felix phenomenon in the light of a group agglutination, the virus of typhus being probably an organism allied to *B. proteus* X 19, but resistant to cultivation on ordinary media.

[5] Ch. Nicolle and Ch. Lebailly: Comptes rendus, clxviii., 1919, 800.

reverses this order. Of the definite cases reported as occurring in these three bones, the order of frequency appears to be about 46 per cent. in the femur, and 27 per cent. each in the humerus and the tibia. One very interesting fact emerges in relation to the site of the lesion; almost without exception all the cases in which the solid form of the disease, as in the example here illustrated, has been observed have occurred in the femur. The reason for this is not clear, but a possible explanation is that in an important weight-bearing bone such as the femur, the resultant thinning is more likely to give rise to deformity and to bring in the bone is found filled with a fairly firm fibrous tissue, often containing fluid in its meshes. Histologically the marrow is seen to be replaced to a greater or lesser extent by fibrous tissue, evidently formed from the endosteum, and there is usually evidence of active and irregular bone formation and absorption. Associated with this condition giant cells are frequently found in excess in the neighbouring tissue. These can, however, clearly represent an increase in the normal giant cells of the part, and are not to be confused with the giant cells of a myeloma. Islands of cartilage are sometimes seen, but only in the neighbourhood



Osteitis fibrosa of upper end of femur in a woman aged 25.

the patient under early observation; as compared with the neck of the femur there is no structure in the humerus or tibia likely to show such early evidence of strain. After these three bones, the next most liable are the fibula and the phalanges (5 per cent.), while cases have also been reported in the clavicle, ulna, os calcis, radius, pelvis, carpus, tarsus and metatarsus; but all of these are, however, very rare.

Pathology.

The essential pathology of osteitis fibrosa is still uncertain, but the naked-eye and histological picture is fairly definite. In cases showing cyst formation the cavities may be present as numerous small spaces, or one single cyst, often of considerable size, may be found. In the majority of these cases a definite cyst wall having the microscopic characteristics of osteitis fibrosa can be demonstrated, and in the absence of this lining membrane the underlying condition can only be conjectured by analogy, and this has led to much of the confusion on this subject. The fluid found in the cysts is not, usually, under any great tension, and is never definitely hæmorrhagic, but is clear or light brown in colour and often very considerable in amount. The surrounding bone is thinned, with no evidence of new deposit, and the condition extends, as a rule, up to the epiphyseal line. In the cases without cyst formation the cavity of the epiphyseal cartilage, and even then with no constancy. Cultures taken from the fluid in the cysts have so far given a negative result.

Symptoms.

The symptoms of osteitis fibrosa are essentially those of its complications and of the deformities that result from it, and the disease may be, and often is, present for a considerable time without sufficiently inconveniencing the patient to force him to seek advice. Pain is very often absent until the onset of some complication, such as fracture, but some patients complain of aching in the bone, particularly at night. In the lower limb cases a gradually developing limp is usually the first symptom noticed by the patient, and as this becomes more pronounced some swelling in the part may also become evident. In the femur these cases closely simulate an ordinary coxa vara, though on careful examination the swelling in the region of the great trochanter can be made out to extend to and merge with a swelling of the upper part of the shaft itself. Tenderness on palpation is often well marked, and judging from the degree of thinning in some cases egg-shell crackling should sometimes be demonstrable. In the humerus the occurrence of a spontaneous fracture or of a fracture following some quite slight degree of violence is frequently the first indica-

tion of the disease. The most helpful evidence from a diagnostic point of view is often given by the X ray appearances. Expansion and thinning of the bone, most marked in those cases with cyst formation and the appearance of a clear space in the bone, crossed by a number of trabeculæ, form the usual picture. The trabeculation, however, is no guide to the extent of actual cyst formation, and may be as marked in the solid cases as in those in which a number of cavities are present. A further point noticed in the X ray pictures is the tendency of the clear area to be prolonged down the shaft in a pointed extension, in contrast to the usually rounded lower limit of a myeloma. The differential X ray diagnosis between osteitis fibrosa, myeloma, other cyst-forming conditions, and some cases of tuberculous disease, is often difficult or even impossible.

Treatment.

There is now universal agreement that a purely local treatment of this condition is abundantly justified by results. The older methods of partial resection, or even amputation, have proved to be unnecessarily severe, and have been abandoned. At present treatment consists in cutting through the bony shell, so as to expose the affected area, which is then thoroughly curetted until all the diseased tissue has been removed. At the same time, or afterwards, any co-existing deformity such as coxa vara, is corrected. The resulting bony cavity is either filled with some such filling as decalcified bone, Mosetig or other paste, or is allowed to fill with blood clot. The only case I can find where recurrence of the disease is reported after this treatment is one published by Korte in 1870. There is often, however, considerable bleeding after this procedure, and Bloodgood mentions two deaths from hæmorrhage and one case where secondary amputation was necessary from the same cause. This freedom from recurrence after purely local treatment is to some extent in support of the view which looks on osteitis fibrosa as a metaplasia rather than an inflammatory condition, and is valuable evidence of its separate pathology from von Recklinghausen's disease.

Diagnosis.

The diagnosis of osteitis fibrosa rests on its differentiation from other conditions causing expansion of the bone during the epiphyseal period. Difficulty sometimes occurs in regard to tubercle, but in this condition the limitation of movement which occurs is in all directions, whereas in osteitis fibrosa it is merely that of the resultant deformity, and, further, in the latter condition it is rare to find pain. From myeloma or endosteal sarcoma the differential diagnosis is often extremely difficult, and here the results of X ray examination are often of great value. In many cases, however, the diagnosis can only be made at operation, or even only after microscopical examination of the tissue removed. Even here difficulties sometimes occur, and cases are seen in which the cellular character of the tissue makes it difficult to be certain of the innocent nature of the section. Indeed, almost all stages, from a typical osteitis fibrosa to an equally typical fibrosarcoma, can be met with, and in doubtful cases only a guarded opinion from the pathological point of view can be given.

Cases Described.

The following case illustrates the disease as it is most often found in the upper end of the femur.

P. W., female, aged 26, attended Guy's Hospital complaining of gradually increasing limp and pain for the past two years following slight trauma. Both the patient and her relatives were positive that nothing abnormal had been noticed more than two years ago. The trouble had got considerably worse for the last two months. On examination the left hip was found to be adducted, flexed, and internally rotated, but some movement was possible in all directions, and there was no spasm. The great trochanter was nearly an inch above Nélaton's line; there was tenderness over it on deep pressure, and it could be felt considerably thickened, the thickening extending down to the shaft. The condition was one of considerable coxa vara associated with expansion of the bone. On X ray examination the extent of the expansion could be seen, and the interior of the bone up to the head and a good way down the shaft was seen to be occupied by a clear space showing well-marked trabeculation.

The patient was admitted and operated on by Mr. E. C. Hughes, to whom I am indebted for permission to use the case. A portion of the outer wall of the femur was removed and the firm fibroid tissue which was found to fill the cavity thoroughly scraped out. At the same time the coxa vara present was corrected as far as possible. On microscopical examination the tissue removed was found to consist of very œdematous fibrous tissue. Although there were no naked-eye cysts, some small ones were seen under the microscope. There were well-marked areas of new bone formation, so that the tissue obviously originated in the endosteum, and the newly formed bone could be seen in active process of absorption by numerous normal-looking giant cells.

The type of osteitis fibrosa as it is commonly found in the humerus is illustrated by the following case, which Mr. C. H. Fagge kindly permits me to use:—

C. H., male, aged 12, attended hospital in 1915. He had broken his arm, after slight violence, three years before and again a year later. Three weeks before attending hospital he had sprained the arm and worn a splint, and a few days later fell and fractured it. There was no pain, but on examination a swelling the size of an egg could be felt below the neck of the humerus. X ray examination showed a growth, expanding the bone, and thought to be an endosteal sarcoma. At the operation, performed by Mr. Fagge, a thin-walled cyst with a definite lining membrane was found, and this was cleaned out and packed with decalcified bone. The material removed proved to consist of blood clot, fibrous tissue, and marrow, with an excess of normal-looking multinuclear giant cells. This patient has had no further trouble with his arm and is quite well four years after the operation.

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AN EXPERIMENTAL RESEARCH INTO THE SPECIFICITY OF THE AGGLUTININS PRODUCED BY PFEIFFER'S BACILLUS.

A Preliminary Report to the Medical Research Committee.

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THIS work was undertaken with the object of ascertaining whether different strains of *B. influenzæ* of Pfeiffer were identical in their immunity reactions—a question of some importance in regard to the ætiology of epidemic influenza. Pfeiffer described this bacillus as the cause of the 1890-91 epidemic of influenza, and until the recent pandemic there had been no opportunity of confirming his work. The findings in the recent epidemic have, however, cast doubts on the ætiological relationship of Pfeiffer's bacillus to the epidemic infection. The bacteriological findings can be summed up by saying that Pfeiffer's bacillus, where the bacteriologist used a medium which specially favoured its growth, was shown to be present in something like 90 per cent. of the cases. It was, however, rarely present alone, but was usually associated with pneumococci or streptococci. The bacillus was more commonly present in cases complicated with bronchitis or pneumonia than in simple cases.

Immunity Reactions of Pfeiffer's Bacillus in Connexion with the Ætiology of Influenza.

The question at issue is whether Pfeiffer's bacillus is the primary infective agent, or whether it is a secondary invader along with the other organisms—pneumococcus and streptococcus—which ordinarily cause inflammatory conditions in the respiratory tract.

Arguments against its being the primary cause of influenza are: 1. It has been found impossible to induce an attack by spraying the throat or nose with a pure culture of Pfeiffer's bacillus.[1]

2. Pfeiffer's bacillus was very commonly present in catarrhal conditions of the respiratory tract for some years before the recent epidemic, and especially was it common in chronic bronchitis. Its presence had often been overlooked owing to the unfavourable nature of the culture media used. When, however, an improved medium was introduced in 1916,[2] its presence was very frequently revealed. It seemed unlikely, therefore, that an organism which was present so commonly when there was no epidemic should suddenly have caused a world-wide pandemic of influenza. It could easily be understood how such a bacillus on gaining access to a community which had previously had no dealings with it could set up a local epidemic, but it is difficult to understand how this bacillus could set up an epidemic rapidly spreading over the whole world and affecting communities in which it had been a common inhabitant of the human body.

In favour of its being the primary cause is the relative constancy of its presence in people suffering from influenza.

If all strains of Pfeiffer's bacillus could be shown to give the same immunity reactions this would form evidence in favour of the spread of infection from one person to another. But if the immunity reactions were different it would then appear probable that the infective agent was of a different nature and that it excited a secondary invasion with Pfeiffer's bacillus, which possibly was leading a saprophytic existence in the respiratory tract of the individual.

The immunity reaction which was chosen for observation was agglutination, as this was easily observed and capable of accurate measurement. Strains of Pfeiffer bacillus were obtained from Boulogne, Etaples, and London. We have accepted as Pfeiffer's bacillus any small Gram-negative bacillus which stains badly with the ordinary basic stains other than carbol fuschin, which does not grow on agar, which gives pin-point colonies on blood agar, which grows luxuriantly on agar containing boiled blood, and which is powerfully symbiosed on blood agar by the proximity of a colony of other organisms, such as pneumococcus or staphylococcus.

Eight rabbits were inoculated with pure cultures of eight different strains. To begin with three subcutaneous inoculations were made, the amount varying from one loopful from a boiled blood agar slope to the whole of the growth from a similar slope. These inoculations evoked practically no response in the production of agglutinins. Then two intraperitoneal injections were given, the first being one loopful and the second the growth from a boiled blood agar slope. These were followed after two days by a moderate production of agglutinins. (Agglutination appeared in a 1 in 160 dilution.) Seven days later intravenous injections were made, and repeated at weekly intervals in doses up to the whole of the growth on one boiled blood agar slope.

All the injections were made with living microbes, and none of the rabbits seemed to suffer from any of the injections, with the exception of one (rabbit No. 3), which appeared to be ill after the first intravenous injection. After three intravenous injections the sera gave a comparatively high titre of agglutinins, so the rabbits were bled and the serum separated. This serum had added to it carbolic acid up to a strength of 0·3 per cent., and was stored in the ice-chest.

Technique of the Agglutination Tests.

Emulsions of the microbe were made in 0·3 per cent. NaCl from 24 hours' old boiled blood agar slopes. We were unable to use cultures in fluid media owing to their liability to spontaneous agglutination. The emulsions used were approximately of the same thickness as Dreyer's standard emulsions for typhoid agglutination. Serial dilutions of the serum to be tested were made in small test-tubes, advancing by twofold steps. ½ c.cm. of the serum dilution was used, and to it was added ½ c.cm. of the bacterial emulsion. Incubation was carried out at 55° C., and it was found that the agglutination of Pfeiffer's bacillus was a very slow process, so that incubation at 55° C. had to be continued for 20 hours before the real power of the serum was manifest. This is shown in the following table, which gives the readings in the same experiment after 7, and again after 20 hours.

[1] Lister and Taylor and others: Publications of the South African Institute for Medical Research, No. XII., 1919.
[2] Matthews: THE LANCET, ii, 104, 1918.

TABLE I.—*Showing the Agglutination of Pfeiffer's Bacillus by Serum after 7 and 20 hours' Incubation.*

	7 hours. Control = 0.						20 hours. Control = 0.					
	1/20	1/40	1/80	1/160	1/320	1/640	1/20	1/40	1/80	1/160	1/320	1/640
1	0	0	0	0	0	0	††	††	††	††	††	††
2	0	0	0	0	0	0	††	†††	††	††	††	0
3	†	†	†	0	0	0	†††	†††	†††	†††	†††	††
4	†	0	0	0	0	0	†	††	††	††	††	††

The scheme used in registering our results is as follows:—
†††† signifies very coarse agglutination.
††† ,, coarse agglutination, but finer than ††††.
†† ,, agglutination just visible to the naked eye.
† ,, agglutination visible with a hand lens.
0 ,, no agglutination.

The agglutination of Pfeiffer's bacillus is a coarse one, the bacilli gathering into large woolly masses and settling to the bottom of the tube. It is not quite so coarse, however, as with the typhoid bacillus.

Great care must be taken that the solutions used are not acid in reaction, otherwise agglutination will occur in the controls; Pfeiffer's bacillus is very sensitive to acids, and is agglutinated by them even in very weak dilution.

Specificity of the Agglutinins.

The agglutinating power of the serum obtained from each of the immune rabbits was tested to each of the different strains of Pfeiffer's bacillus, and the results are set forth in Table II.:—

TABLE II.

Serum 1.—Rabbit Immunised with Strain 1, obtained from Boulogne.

Strain of bacillus.	Dilution of serum. Control = 0.							
	1/50	1/100	1/200	1/400	1/800	1/1600	1/3200	1/6400
1	†††	†††	†††	†††	†††	††	†	0
2	0	0	0	0	0	0	0	0
3	†††	†††	†††	†††	†	0	0	0
4	††	††	††	0	0	0	0	0
5	†	††	††	†	0	0	0	0
6-8	0	0	0	0	0	0	0	0

Serum 2.—Rabbit immunised with Strain 2, obtained from Etaples.

Strain of bacillus	Dilution of serum. Control = 0.					
	1/50	1/100	1/200	1/400	1/800	1/1600
1	0	0		0	0	0
2	†††	†††	††††	††††	††††	0
3	0	0	0	0	0	0
4-10	0	0	0	0	0	0
11	††††	0	0	0	0	0
12-13	0	0	0	0	0	0

Serum 3.—Rabbit immunised with Strain 3, obtained from London.

	Dilution of serum. Control = 0.							
	1/50	1/100	1/200	1/400	1/800	1/1600	1/3200	1/6400
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	†	†	††††	††††	††††	†††	†	0
4-10	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0
12-13	0	0	0	0	0	0	0	0

Serum 4.—Rabbit immunised with Strain 4, obtained from London.

Strain of bacillus.	Dilution of serum. Control = 0.					
	1/50	1/100	1/200	1/400	1/800	1/1600
1	††	††	0	0	0	0
2	††	†	0	0	0	0
3	†††	††	0	0	0	0
4	†††	†††	††	††	†	0
5	0	0	0	0	0	0
6	0	0	0	0	0	0
7-13	0	0	0	0	0	0

Serum 5.—Rabbit immunised with Strain 5, obtained from Etaples.

	Dilution of serum. Control = 0.						
	1/50	1/100	1/200	1/400	1/800	1/1600	1/3200
1	0	0	0	0	0	0	0
2	††	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	††††	††††	††††	††††	††††	††	0
6	††	0	0	0	0	0	0
7-13	0	0	0	0	0	0	0

Serum 6.—Rabbit Immunised with Strain 6, obtained from Boulogne.

Strain of bacillus.	Dilution of serum. Control = 0.								
	1/50	1/100	1/200	1/400	1/800	1/1600	1/3200	1/6400	1/12800
1	0	0	0	0	0	0	0	0	0
2	†	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0
4	†	†	††	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
6	††††	††††	††††	††††	††††	††††	††††	††††	††††
7-9	0	0	0	0	0	0	0	0	0

Serum 7.—Rabbit immunised with Strain 7, obtained from Boulogne.

Serum 8.—Rabbit immunised with Strain 8, obtained from London.

Strain of bacillus.	Dilution of serum. Control = 0.						Dilution of serum. Control = 0.					
	1/50	1/100	1/200	1/400	1/800	1/1600	1/50	1/100	1/200	1/400	1/800	1/1600
1	0	0	0	0	0	0	††††	0	0	0	0	0
2	0	0	0	0	0	0	††††	††††	††††	††††	††††	0
3	0	0	0	0	0	0	†††	††	0	0	0	0
4	0	0	0	0	0	0	†††	†††	0	0	0	0
5	0	0	0	0	0	0	†††	††††	0	0	0	0
6	0	0	0	0	0	0	†††	†††	0	0	0	0
7	††††	††††	††††	††††	††	0	††	††††	††††	††	0	0
8	†	†	0	0	0	0	††††	††††	††††	††††	††††	0
9	0	0	0	0	0	0						

Conclusion.

These results show clearly that the different strains of *B. Pfeiffer* are very different in their agglutination reactions, and as there was so much difference between them it seemed quite unprofitable to engage in a more extended series of tests. In most of the cases the agglutinins formed are either quite specific to the particular strain injected, or they are very nearly so, and in every case but one agglutination was observed in a much higher dilution with the homologous strain than with any of the others. The one exception (8) agglutinated one of the heterologous strains to the same titre as the homologous strain, and it agglutinated all the other strains tested to a lesser extent.

In marked contrast to this is the case of Serum 3, which agglutinated the homologous strain to a dilution of 1/1600, but gave no agglutination with any of the others even in a dilution of 1 in 50.

While this work was being done a communication was received through the Medical Research Committee from Dr. Park, of New York, who had been working on the same lines. Dr. Park obtained results similar to those set forth above, showing that almost every strain as regards agglutination is a law unto itself. He had had the opportunity, however, of testing the reactions of Pfeiffer's bacillus obtained from different members of a small community who had obviously been infected with influenza from a common source. In this small community the different strains of Pfeiffer's bacillus were entirely different as regards the agglutination test.

These results indicate that the *B. influenzæ* of Pfeiffer is really an associated group of bacteria without the marked unity in its immunity reactions as is seen in other epidemic-causing bacteria, such as typhoid and cholera.

So far as our present knowledge of epidemic bacteria goes, the facts set out above, agreeing as they do with Dr. Park's results in New York, are a strong indication that Pfeiffer's bacillus is not the primary cause of influenza, but that the primary infective agent awakens the activity of organisms which have been leading a more or less saprophytic existence in the respiratory tract.

These results are also of importance in connexion with the preparation of stock vaccines of Pfeiffer's bacillus. The results obtained during the last epidemic have shown that such a vaccine is valuable both for prophylactic and therapeutic purposes, and the experiments cited above indicate that such a stock vaccine should consist of a very large number of strains. It might be that in the vaccine there were a number of strains similar to Strain 8, which stimulated the production of antibodies to many other strains; but it seems more likely that most of the strains would be less complete antigens, so that in the present state of our knowledge it would be desirable to incorporate many strains of Pfeiffer's bacillus in the vaccine to make it widely polyvalent.

In conclusion, we wish to thank Colonel S. L. Cummins, who, while Adviser in Pathology to the British Army in France, was the means of our being supplied with strains of Pfeiffer's bacillus from different areas.

RUPTURE OF INTESTINE WITHOUT EXTERNAL INJURY.

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IN Mr. Gerald Stanley's and Mr. W. H. Battle's very interesting papers on traumatic rupture of intestine without external wound in your issues of July 19th and Oct. 25th I see, in discussing the cause of the rupture, that Mr. Stanley says (p. 727):—

"If the abdomen is struck above the umbilicus the force is transmitted to the first few feet of the jejunum. The mobility of this coil allows it to be pushed till it is checked ultimately by the vertebral column, and between the latter and the moving body it is crushed and ruptured."

I am inclined to think there are two other factors: (1) Hydrostatic pneumatic effect; (2) kink.

The small intestine contains fluid and gas, sometimes more, sometimes less. Any sudden violent compression applied to the abdomen tends to force fluid and gas out of the coils in its way. This force, acting on fluid and gas in a tube, acts equally and in all directions, and at first tends to balloon the tube. If the ends are unobstructed the contents are forced, aided by the elastic recoil of the tube, in the direction of its length—path of least resistance. This goes on until contents, or pressure only if tube full, slams up against the kink where the resistance is absolute. The pressure, communicated in the case of a full tube, or actual movement of contents in one collapsed, accentuates the kink. The tube balloons and ruptures at its unsupported margin. A complete transverse rupture occurs in a tube full of fluid to which sudden pressure is applied. It slams against the kink (duodeno-jejunal flexure), as in the case described by Mr. Stanley. It is the *full* tube which causes the rupture. It will be argued that fluid and gas should go down as well as up. So they do. Some goes up and some goes down. But there is no kink below.

In rupture of intestine a small rent indicates gas and a large one fluid contents. Gas is compressible, but fluid, for the purposes of this tube, absolutely incompressible. In the case of a full tube there is no actual movement of contents, only transmission of force. The duodenum ruptures above the duodeno-jejunal kink, and the ileum below. Any coil of small intestine temporarily caught distended with gas and some fluid, and from this cause having a slight twist, supplies its own kink. It is already ballooned, and if sufficient force is applied it ruptures at its unsupported margin. Rupture is more serious in the upper part of this tube, as there is more fluid and less gas. Gas tends to remain in the stomach and not pass on. The effects of sudden pressure are much more smashing on a tube distended with fluid than one distended with gas. In the lower part of the intestine any distension is caused by gas and effects of sudden pressures are less noticeable, and there are no kinks, except at the ileo-cæcal junction.

Intestinal Gas and Fluid Pressure in other Abdominal Conditions.

Duodenal and gastric ulcer.—I think the cause of the ulcer is not an erosion in the first place, but is an expression of damage to mucous membrane due to constant ballooning by plus pressure gas and fluid. The pressure acts at the pyloric end of the stomach and duodenum. If there is any disturbance with the mechanism at the pyloric sphincter, such as may be shown on the X ray screen by delay after an opaque meal, the pylorus tends to balloon and is most unsupported on its anterior surface. Constant stretching

causes a wound of the mucous membrane with subsequent irritant action of acid contents and bacterial infection due frequently to pyorrhœa. The ulcer is prevented from healing by the constant stretching, and when rupture takes place it needs a very little plus pressure to do it. An ulcer in the stomach is subjected to gas pressure. An ulcer in the duodenum is subjected to fluid pressure, hence the urgency of the symptoms of the rupture. A chronic dyspepsia, bad teeth, and constipation all cause gas.

Hernia.—I wondered for some time what force took the small intestine through the neck of a hernial sac. The force is: (1) Increased pressure inside the abdomen—dyspepsia and constipation, causing gas; (2) compression of abdominal cavity by muscles—strain, lifting weights, and application of force. Both forces usually act—effort causes attempted diminution in size of cavity containing gas. A small knuckle of intestine containing gas balloons through a hernial aperture and more gas passing through tends to distend it. Its margin is temporarily unsupported. The peritoneal surface of the intestine in health is smooth, shining, and slippery. The resistance due to ballooning of the engaged knuckle is obviously greater than friction to be overcome in bodily moving the tube.

A Richter's hernia is an example in which the force acts and balloons the unsupported margin, as it cannot move the tube owing to (1) adhesions, (2) undilatability of neck of sac owing to strong surrounding structure: e.g., femoral—Gimbernat's and Poupart's ligaments; obturator—bone and thyroid membrane. The mechanism of reduction is to squeeze out the contents and then the gut follows—hence the familiar gurgle. Once gas is squeezed past the neck of the sac it pulls the gut back. Many hernias reduce themselves on lying down, as pressure in the abdomen is normally negative with slight positive variations.

Strangulated hernia.—The condition of the gut found at operation is not so much due to strangulation of the vessels as to ballooning and thinning of the intestine owing to gas pressure. There is an absolute kink at each end and gases are being formed by bacteria, &c. This seems fairly obvious as the intestinal tube can be clamped during operation, its blood-supply absolutely cut off, with no urgent symptoms. The urgency of the symptoms is due to a kink at the upper end of the hernia affecting the tube *above* the hernia.

Hernia operations.—Plus pressure in the abdomen, either caused by strain, gas, or a combination of the two, tends to balloon intestine through any aperture. Operations should close the aperture, leaving a smooth well-supported surface with no pockets. If any pockets are left, the gas in the gut tends to dilate them as the pressure acts equally in all directions. In recurrent operations I rather think more care should be taken to keep abdominal pressure negative.

Appendicitis.—Put in a word, the mechanism here is: appendix—short mesentery, kink; cæcum—fluid and gas pressure. Bad teeth lead to a preference for carbohydrate diet, which is easier to chew. Bad teeth and diet lead to dyspepsia and constipation, which means gas production. In the cæcum there is increased pressure, and cæcum tends to balloon. This does not do much harm to the cæcum. It is quite a different matter for the appendix to which the pressure is transmitted. It cannot balloon much and tends to rupture at the kink. If peritonitis occurs as a result of perforation of the appendix, it is caused by a sudden great increase of pressure. If an abscess occurs as a result of perforation it is due to chronic small increase of pressure. Enemas in "observation" appendix cases may do good or do harm. If they relieve the pressure by removing contents of the colon and gas the pressure falls and the appendix will not rupture immediately. If the usual measures are taken (starvation, &c.) the case gets well without operation. On the other hand, if they remove some of the contents of the colon but no gas, they may actually increase the pressure and cause the rupture.

Constipation.—Gas caused by bacteria, &c., balloons the tube, as colon is unsupported in the correct position except at kinks. This condition becomes permanent as intestinal muscle loses tone. The ballooning accentuates the kinks and so actually obstructs the passage of the contents. All secondary effects are due to invasion of the mucous membrane of the tube with organisms, &c.

Gas Pressure.

In conclusion, I may add I have purposely laid stress on gas pressure in the abdomen as an exciting cause of acute and chronic abdominal conditions. Everybody is agreed as to gaseous distension *after* the condition is produced, but I do not think its effect as a *cause* of abdominal conditions has been sufficiently recognised, except perhaps in intussusception and volvulus. Sir Arbuthnot Lane's operation is designed to relieve the patient of a colon damaged by gas and infected by various organisms. The absence of the intestinal contents means no gas, as there is nothing for the organisms to grow on.

Gas pressure is the origin of intestinal movements. It excites peristalsis in a normal tube and if increased or often applied in a tube with kinks, causes ballooning and pouching. Organisms present cause gas. Most purgatives act by increasing gas formation and excite increased peristalsis, hence their gradual failure; the tube ceases to react to the pressure and dilates. It seems very unwise often to subject a tube, with as many kinks as the colon, to increased pressure. When this has been done, usually by the patient having himself used purgatives wholesale, the advisability of short-circuiting, to relieve him of the secondary toxic effects, has to be considered. Mr. Fletcher's method of eating seems to reduce the gas formation to a minimum. People who bolt their food may actually swallow gas with each bolus; otherwise the bolus would stick, but wrapped in an air cushion it passes safely on.

Clinical Notes:

MEDICAL, SURGICAL, OBSTETRICAL, AND THERAPEUTICAL.

A CASE OF

GENERALISED TUBERCULOSIS

PRESENTING DIFFICULTIES IN DIAGNOSIS.

BY F. J. NATTRASS, M.B., B.S. DURH., M.R.C.S. ENG., L.R.C.P. LOND.,

CAPTAIN, R.A.M.C. (T.), SPECIAL MILITARY SURGICAL HOSPITAL, NEWCASTLE-UPON-TYNE.

THE following case of obscure illness is of interest in illustrating the difficulty in diagnosis of deep-seated tuberculous infection, and the value of X ray examination of the chest in such cases.

Pte. J. R. R., aged 18 years, with nine months' service, was admitted to the 1st Northern General Hospital, Newcastle-upon-Tyne, April 7th, 1919. The history was that in the previous month he spent a week in hospital with influenza; a week after discharge from hospital he began to have pain and swelling in the right hand and pain in both hips. On admission temperature was 103° F., pulse 110, respirations 24, and the case was diagnosed as acute rheumatism. Sodium salicylate was administered, but the temperature remained high, varying in the evenings from 100·5° to 102°, with morning remissions of about one degree. This was the condition when the case was transferred to me on May 6th, on the demobilisation of the 1st Northern General Hospital. The patient was pale and sweating, had lost much weight, but was not markedly emaciated; in the neighbourhood of the right carpo-metacarpal joints there was a painful fluctuating swelling, which was not red and showed no sign of pointing. The pain in the hips, which had never been severe, was now only slight. X ray photographs of the hand showed slight blurring of the joint surfaces between the carpal bones and the three inner metacarpals; X ray photographs of the hips showed no abnormality. There was no sign of endocarditis, no discoverable abnormality in the abdomen, no cough, and the only physical sign of disease other than the swelling of the hand was a localised dry pleuritic rub at the base of the right lung. Within four or five days this rub disappeared, and was replaced by an occasional crepitation at the bases of both lungs posteriorly; these crepitations, however, also disappeared in a few days, and after this no physical signs of disease could be found in the chest, on repeated examination, until within ten days of death, which took place on July 4th, 1919.

As the diagnosis of acute rheumatism appeared to be definitely negatived careful search was made for other forms of infection. Specimens of urine, passed in the early morning and the centrifugalised deposit of 24 hour's collection, were examined by Dr. P. C. W. Laws for gonococci with negative results. On the supposition of a

secondary infection following influenza, a specimen of blood was examined for the presence of organisms, but no growth was obtained. Meanwhile the temperature of the patient remained high with morning remissions, and the general condition became steadily worse. A deep-seated tuberculous infection was suspected in spite of the absence of physical signs, and this was finally confirmed in two ways. Firstly, after the examination of numerous films of the urinary deposit, Dr. Laws discovered, on June 10th, one tubercle bacillus. Secondly, on the same date, Major W. D. Arnison took an X ray photograph of the chest, which showed beautifully the lesions of a hilum tuberculosis spreading outwards to the surface of the lungs.

Not until ten days before death could any definite physical signs of disease be found in the lungs, and then there appeared almost simultaneously in each axilla a few moist crepitations, which rapidly increased in number, at the same time the patient developed a slight cough, but this was never marked, and he brought up very little sputum. On July 2nd, two days before death, the patient was seized with sudden severe abdominal pain, and the abdomen rapidly became very distended and tympanitic; the cause of this was only elicited after death. The patient died on July 4th, and the post mortem was performed on July 5th by Professor Stuart McDonald.

Report of Post-mortem Examination.

Abdomen.—Large amount of free gas in peritoneal cavity evidence of septic peritonitis, mainly in the neighbourhood of the iliac and pelvic colon, but not much free fluid. The peritonitis was found to be due to the rupture of a tuberculous ulcer in the pelvic colon; there were numerous other ulcers in all parts of the colon, and a few in the lower part of the ileum. There were numerous tuberculous glands in the mesentery and tubercles in the omentum. The liver and kidneys showed advanced cloudy swelling and many small tuberculous deposits of varying size, but larger than those generally found in acute miliary tuberculosis.

Chest.—Beyond slight fatty change the heart showed no abnormality and there was no pericarditis. Over the whole surface of both lungs the pleura was thickened into a firm fibrous plate about one-tenth of an inch thick. From the inner surface of this dense plate, thickened fibrous strands of the interlobular septa extended in towards the hilum of the lungs; in addition, there was considerable fibrosis in connexion with the bronchial sheaths (peribronchial fibrosis). Scattered more or less uniformly through the lung substance, but especially evident in the upper lobes, were fibro-caseous tubercles with polycyclic outlines; these ranged in size from one-fifth of an inch to a pin's head. The majority of these were in relation to the bronchial sheaths and the interlobular septa, but in some places there were moniliform tubercles along the septa and peribronchial sheaths. The intervening lung tissue showed comparatively little change, but there was decided and diffuse fibrosis; there was no cavitation. The glands at the hilum of each lung were enlarged with fibro-caseous tubercles and some anthracosis.

Microscopic examination of the lungs.—The outstanding feature was the presence of conglomerate areas of fibro-caseous tubercles, which stood in relation to the bronchial sheaths and which extended outwards to some extent into the surrounding lung tissue. In some places the tuberculous process had eroded through into the small bronchi. The surrounding lung tissue showed comparatively little change, the alveolar capillaries being engorged and the alveoli somewhat collapsed; the latter contained a serous exudate with a small number of catarrhal and pigment-bearing cells. In the alveoli immediately adjacent to the tuberculous areas there was a considerable amount of cellular exudate. The bronchial sheaths showed considerable old fibrosis, and the vessel walls were somewhat thickened. Sections stained for tubercle bacilli showed that in the caseous areas tubercle bacilli were present, but comparatively scanty. In the surrounding zone of cellular infiltration they were present in very large numbers. In the more healthy alveoli very few bacilli were to be seen, and in the neighbourhood of the terminal bronchioles they were also scanty. The carpo-metacarpal joints of the right hand showed tuberculous disease with erosion of the cartilages. The head was not examined, but there was no indication during life of involvement of the central nervous system.

The points in this case which are of special clinical interest are as follows:—

1. The onset of symptoms in the form of a comparatively mild attack of so-called influenza.
2. The unusual and early involvement of the small joints of the hand.
3. The complete absence of physical signs at the apices or any other part of the lungs until a late stage of the case; the extreme universal thickening of the pleura doubtless made it impossible to detect any slight parasternal dullness such as might have been expected.
4. The absence of tubercle bacilli in the sputum in spite of the enormous number demonstrated in the lung tissues after death.
5. The mode of death by rupture of a tuberculous ulcer in the pelvic colon.
6. The great value of X rays in the diagnosis of deep-seated tuberculosis in the chest.

I have pleasure in acknowledging my indebtedness to my commanding officer, Lieutenant-Colonel D. Wells Patterson, O.B.E., R.A.M.C. (T.), for permission to report the case; also to Dr. Laws, bacteriologist to this hospital and to the X Ray and Pathological Departments, Royal Victoria Infirmary, Newcastle-upon-Tyne.

A CASE OF

BILHARZIASIS IN NATAL, TREATED BY TARTAR EMETIC.

BY F. G. CAWSTON, M.D. CANTAB.

ON July 17th L. P. came to me for treatment. He stated that he had suffered from continuous hæmaturia ever since he was 7 years of age, when he contracted bilharzia disease from bathing at Pietermaritzburg, Natal. *Physopsis africana* is plentiful in the river at Pietermaritzburg. In 1916 I collected over 400 specimens from the reeds at the water's edge there and found that 75 harboured schistosomes.

The hæmaturia had shown itself every day and had not responded to treatment by various medicines, including large doses of male fern taken under medical supervision. The patient was now 25 years of age, anæmic, and unable to take severe exercise without exhaustion. The cloudy urine contained shreds of mucous membrane, blood cells and spine-pointed ova. These ova were 0·14 by 0·07 mm. in diameter.

In view of his general malaise, I advised him to take the following prescription for a few days:—

Ferri et ammon. cit. ... gr. v.
Liq. ars. ... ... ♏ iii.
Inf. gent. add ʒ ss. t.d.s., a.c.

I then commenced treatment by intravenous injections of a solution containing antimonium tartrate gr. ½ in 15 minims of distilled water, gradually increasing the dose to gr. 2, and then reverting to gr. 1 every few days. In all gr. 12 were given, and 3 c.cm. of collosol antimonium. Treatment was started on July 17th, when the urine was cloudy and contained ova. By August 9th the urine was clear of ova, and with the exception of one ovum seen in a specimen examined on August 20th no more were ever found, though examinations were continued until Sept. 27th. The last injection was given on Sept. 6th. In every case the solution was made up fresh and boiled shortly before each injection. After an injection the patient kept his arm well bathed with cold water to avoid any local reaction. He stayed indoors for the remainder of the day, but experienced no discomfort, except an irritating cough which lasted about two minutes, immediately after the administration of gr. 2 of the drug. Throughout the treatment he was able to carry on his work as an engineer without interruption. After an intramuscular injection of collosol antimonium on two occasions, however, he felt ill throughout the following day, but was still able to attend to his work. After the fourth injection the patient did not notice any more blood in the urine except very occasional clots, and he discontinued taking the tonic. At the end of a fortnight he said he felt much better and that the urine was remaining clearer than it had been for 18 years. After six weeks' treatment he had gained 4 lb. in weight.

In examining the urine for ova the patient was instructed to procure the last few ounces passed and to send along any suspicious-looking specimen. Unless centrifugalised, this

was set aside for 36 to 48 hours and the sediment submitted to a thorough microscopic examination. On each occasion the fresh specimen of urine was found to be acid.

In this case a relatively small quantity of antimony, given at short intervals, seemed to be sufficient to effect a cure for this common and intractable parasitic affection.

In view of the reported hepatitis occurring in patients who have harboured the bilharzia worm and undergone treatment by tartar emetic injections, it is interesting to note that this patient suffered from occasional biliousness and a distinct tender swelling in the region of the gall-bladder which he had noticed for several years. Since discontinuing the intravenous injections this tender swelling has completely disappeared, and it is more than probable that it was in some way related to the presence of the parasites in the portal system.

Durban, Natal.

NOTES ON A CASE OF

FILARIA LOA (SUBCONJUNCTIVAL).

BY R. R. JAMES, F.R.C.S. ENG.,
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AND
E. L. HUNT, M.B., B.S. LOND., D.P.H. CAMB.,
BACTERIOLOGIST, ST. GEORGE'S HOSPITAL.

CASES of filaria loa are unusual in this country, but since such cases may be more frequently met with now that men who have been on active service in the African campaigns are returning to England, it may be of interest to record one observed by us.

Major T. was on active service in the Cameroons and left Africa at the end of 1916; he subsequently served in France. Beyond an occasional "tight" feeling in the chest he had had no symptoms until the evening of Sept. 12th, when he experienced a pain in the left eye, which he attributed to a foreign body. He looked at his eye in a glass and was able to see something wriggling on the lower part of the globe just under the surface. He went to St. George's Hospital, where the house surgeon could see nothing wrong with the eye and was inclined to be sceptical about the presence of a worm. However, the house surgeon advised him to consult one of us (R. J.), who found on Saturday morning, Sept. 13th, a worm wriggling about on the upper outer side of the globe between the edge of the corner and the equator of the globe under the conjunctiva.

It is of prime importance in these cases to fix the worm as soon as it is discovered, so after instilling four drops of 2 per cent. cocaine solution, a suture was passed through the subconjunctival tissue beneath the worm, thus fixing it in its position. There being no assistance at hand, Major T. was asked to hold the ends of the suture and to keep them taut. With scissors and forceps an incision was made into the conjunctiva at the upper pole of the curled-up worm; almost at once a loop of worm projected itself through the opening, and one blade of the forceps being passed through the loop, the worm was seized and pulled out. The parasite proved to be a parent female *Filaria loa*, and measured approximately 2½ inches in length. Under the microscope (one-sixth objective No. 6 eye-piece) the surface of the worm was seen to be studded at intervals with small protuberances. Examination of the patient's blood, some two hours after removal of the worm, failed to reveal the presence of any micro-filaria diurna, but showed an eosinophilia of about 20 per cent.

A MUNIFICENT GIFT FOR RESEARCH.—The Rockefeller Institute, which has already received from its founder, Mr. John D. Rockefeller, gifts to the value of £5,500,000, and real estate approximating to £500,000, has now received a further gift of £2,000,000 for medical research. The present scientific staff of the institute numbers 65, while 310 persons are employed in technical and general service.

WEST OF ENGLAND EYE INFIRMARY, EXETER.—The annual meeting of the governors of this charity was recently held. The medical report showed that 2653 patients had been treated during the past year. It was stated that shortly a small ward will be used for the admission of infants suffering from contagious eye disease. The committee, with great regret, alluded to the resignation of the senior honorary surgeon, Mr. A. C. Roper, who has been connected with the institution for the past 27 years, and he was elected on the honorary consulting staff.

Medical Societies.

ROYAL SOCIETY OF MEDICINE.

SECTION OF PATHOLOGY.

THE RELATIONSHIP BETWEEN SPHENOIDAL SINUS EMPYEMA AND EPIDEMIC CEREBRO-SPINAL FEVER.

A MEETING of this section of the Royal Society of Medicine was held on Nov. 4th, Professor W. BULLOCH, the President, being in the chair.

Mr. DENNIS EMBLETON read a paper on the Relationship between Sphenoidal Sinus Empyema and Epidemic Cerebro-spinal Fever. The findings in post-mortem examinations made on cases dying from cerebro-spinal fever in the Netley district between 1915 and 1919 were quoted. Of the 34 deaths, 21 were the result of the acute illness, 6 the result of a recrudescence, and 7 from hydrocephalus after recovery from the acute illness. Empyema of the sphenoidal sinus was present in 32 cases and was not found in 2. Meningococci were seen or grown from the empyema in 20 cases; were not found in 12 cases. Inflammation of the sphenoid bone overlying the empyema was not found in hydrocephalus or recrudescence cases, but was found in 7 cases dying during the acute illness. The meningococcus was found 3 times in the inflamed bone. In no case was any naked-eye sign of inflammation discoverable about the cribriform plate of the ethmoid. The contents of the pituitary fossa showed inflammation in every case. The middle ear was only found to be inflamed in 2 cases. Only 11 cases out of 34 died during the first week of the disease. Other observers had not found so high a percentage of sphenoidal empyemata in their fatal cases, and had found that more than half the deaths occurred during the first week of the disease. It was suggested that the early and systematic use of antimeningococcic serum at Netley saved many patients who would otherwise have died during the first week of the disease, and also those patients in whom sphenoidal empyemata were not persistent.

The relationship between sphenoidal empyema and the onset of cerebro-spinal fever was then discussed. The primary site of meningococcus infection in the human body was the nose, where a catarrhal condition might eventuate. The frequency of the carrier condition and the relative infrequency of the disease had been noteworthy. The whole population of England had probably been carriers during the last five years, yet the total number of cases had been small. It was considered probable that the natural disease produced by the meningococcus was a nasal catarrh, and that it was only when some other factor came into play that cerebro-spinal fever resulted. An increase in virulence of the meningococcus did not seem to be this factor, for camp epidemics about Winchester were only on one occasion due to one serological type of meningococcus. Usually during an epidemic two or more types of coccus were found in consecutive cases. On one occasion two cases of cerebro-spinal fever occurred in one ward within four days of one another. One was due to a Type 2 coccus, the other to a Type 1 or 3. It was suggested that the factor which produced a case of cerebro-spinal fever in a man infected with the meningococcus was the occurrence of a sphenoidal empyema, set up by an inflammatory reaction to the meningococcus on the part of the mucous membrane of the sphenoidal ostia. The various possible routes by which the meningococcus could gain access from the nasal mucosa to the meninges, and so produce meningitis, were then discussed.

1. *The arachnoid prolongations round the olfactory nerves* was the route favoured by Netter and Debré, and Flexner, but the experimental data on which this path was advocated only showed that meningococci could gain access to the nose from the meninges and not the reverse. It was considered unlikely that meningococci could pass by this route against the lymph stream, unless inflammatory extension occurred. No inflammation was seen by naked eye in the ethmoid region.

2. *Perineural lymphatics* suggested a possible route, inasmuch as the lymph flow was in the right direction—i.e., towards the brain—and particulate material could be conveyed into the cerebral substance. As, however, cerebro-spinal fever did not start as an encephalitis, and as it was

shown that neither toxins, dyes, nor bacteria gained access to the cerebro-spinal fluid when passing by this route, this path was not thought to be the correct one.

3. *Inflammatory extension* from an empyematous sphenoidal sinus was present in seven cases in this series of necropsies, meningococci having been found in the sphenoidal bone overlying an empyema three times. In the other cases no naked-eye inflammatory change was seen. This path was not felt to be the usual one.

4. *The pituitary fossa* was found inflamed in all cases, but as this would have occurred from its intimate association with the cerebro-spinal fluid, a possibly patent connexion with Luschka's pharyngeal tonsil was not considered as a likely path for the spread of infection from the nasal mucosa to the meninges.

5. *Systemic lymphatics* flowed from the naso-pharynx by way of the deep cervical lymphatics to join the venous system in the neck. Inflammation of the nasal mucosa, especially if followed by a sphenoidal empyema, would pour large numbers of meningococci from the very beginning of the disease into the blood stream. It was suggested that if an empyema of the sphenoidal sinus occurred a reversal of the lymphatic stream might occur in the neighbourhood of the sphenoidal sinus, whereby meningococci might be driven toward the meninges instead of following the normal lymph stream in the opposite direction. This might give rise to infection of the meninges without naked-eye signs of inflammation over the sphenoidal bone.

6. *The blood stream* was shown to be early infected with the meningococcus, which by this route might infect the meninges. Empyemata of the sphenoidal sinus, which were frequently found in connexion with "Spanish influenza" necropsies, were very rarely found associated with meningitis.

7. *The middle ear* only showed inflammation in two of the 34 post-mortem examinations. It was considered unlikely that infection occurred by this route.

Meningococci probably gained access to the meninges by way of the lymphatics from the empyematous sphenoidal sinus, with or without signs of inflammatory extension. It was also thought possible that meningococci could be conveyed by the blood stream.

The relationship between persistent sphenoidal empyema and the development of hydrocephalus was considered. A persistent sphenoidal empyema was found in all the 10 cases of hydrocephalus, the meningococcus having been demonstrated in the pus in 5 cases. Five cases were operated upon for drainage of the sphenoidal empyema; 3 recovered completely and showed no further signs of hydrocephalus; 2 died. The 3 cases that recovered as a result of this operation were the only cases of hydrocephalus that did not die. The relationship between a persistent sphenoidal empyema and the development of hydrocephalus appeared to be close. Operation on the sphenoidal empyema always produced an exacerbation of the symptoms. Three cases that were operated upon during the acute stage for drainage of the empyemata died. The increase in the severity of the symptoms following the operation appeared to accelerate at any rate a fatal termination. In hydrocephalus cases the operation was followed by recovery in 3 out of 5 cases, the only 3 cases that recovered from this condition. One of these went through a typical relapse, the meningococcus reappearing in the cerebro-spinal fluid, apparently as a result of the operation. The patient subsequently made a complete recovery.

In conclusion, in 34 necropsies on persons dying from cerebro-spinal fever, empyemata of the sphenoidal sinus were found 32 times. In 10 cases of hydrocephalus following cerebro-spinal fever, an empyema of the sphenoidal sinus was found in every case. In 47 completely recovered cases, no sphenoidal empyemata were present. The course of events in a case after infection of the nasal mucous membrane with the meningococcus might be as follows: 1. A simple catarrh followed either by recovery or a chronic infection. 2. A vigorous local reaction in the nasal mucosa, followed by sphenoidal empyema. This might produce a general blood infection, with or without infection of the meninges. If the sphenoidal empyema cleared up, the body, with or without the aid of antiserum, might be able to deal with the meningococci that had gained access to it, or death might result. If the sphenoidal empyema persisted, and very heavy discharges of meningococci were poured into the body, death would probably occur. If, however, the empyema remained quiescent, improvement might take place, but at any time a recrudescence or a relapse might supervene. A quiescent empyema might also keep up a smouldering infection which would lead to hydrocephalus.

A Bodo-like Flagellate in the Urinary Tract.

Professor ARTHUR POWELL read a paper describing a Bodo-like Flagellate persisting in the Urinary Tract for five years. Four previous observers, he said, had found flagellates in urine, but always in urine which was decomposing and stale and never in freshly drawn urine. Pathologists were therefore justly sceptical as to their parasitic nature. They had been found in human urine, but not in the human body, and were regarded as accidental contaminations. In his case the flagellates were constantly present in the urine drawn with aseptic precautions, and they died when the urine decomposed. They were first seen when the urine was chylous (filariasis) and they persisted when the urine was otherwise normal. This pointed to the flagellates being emigrant, via the lacteals, from the alimentary canal. There was a striking difference in the habits of the flagellates in 1914 and in 1919. Was this an adaptation to the new environment? As far as he could judge the parasites were harmless.

SECTION OF SURGERY: SUBSECTION OF ORTHOPÆDICS.

Exhibition of Cases.

A MEETING of this section of the Royal Society of Medicine was held on Nov. 4th, Mr. MUIRHEAD LITTLE, the President, being in the chair.

Birth Palsy in a Boy.

Mr. R. C. ELMSLIE showed a case of Birth Palsy in a boy aged 11 years, who was the eldest of three children. Delivery was instrumental, and three days later it was noticed that the arm hung at the side and was not used. There had been no treatment. At the present time all the muscles of the right upper limb appeared to be acting except the external rotators of the shoulder. The arm was held in a position of abduction and forward flexion, only a small range of movement being present. The elbow was flexed, complete extension being impossible. There was a posterior subluxation of the head of the humerus. X ray examination showed that the head of the humerus was much deformed and flattened. Mr. Elmslie proposed to perform Mr. Fairbank's operation of division of the anterior part of the capsule of the shoulder-joint and the tendon of subscapularis, after which he would fix the arm in a position of abduction to a right angle for three months, to be followed by physical treatment.

Mr. H. A. T. FAIRBANK said that the position of the arm was not unusual, though it was difficult to explain. Subluxation was due to lack of support behind the joint, associated with contracture of the anterior muscles. The abduction was difficult to understand. He had found at operation that until the suprapinatus and the coracoid ligament were divided adduction was impossible. The after treatment was interesting and important. The results were not good on account of the difficulty in getting the children to attend regularly and frequently for treatment. He thought that the position with the elbow at the side was bad, and in future would suggest abduction for the first month, and for the next two months a splint should be worn, which could be removed to allow massage.

Mr. A. S. BLUNDELL BANKART said that it was contrary to experience for contracture to follow immediately after an injury to a nerve, but he had seen contracture follow very soon after birth, and thought it was congenital and not due to birth palsy. He thought that half the cases which were regarded as birth palsy were congenital contracture with malformation of the shoulder-joint. In this case there was no evidence that there had been any paralysis. He had seen cases with the arm in the same position very shortly after birth.

Mr. LAMING EVANS said that the hooking of the acromion process was important and might be pathognomic of birth palsy. He asked if cases in which hooking of the acromion process was seen in after life were cases of old birth palsy.

Mr. ELMSLIE said that he had seen cases of primary palsy with flail joint develop within a few weeks into contracture. He usually treated cases of birth palsy with splints, the arm being abducted and externally rotated, and at a right angle.

It was difficult to get the position after two or three weeks as contracture had set in. He thought that the subluxation was due to shortening of the anterior part of the capsule, which levered the head of the humerus backwards behind the joint.

A Case of Os Tibiale Sesamoideum.

Mr. ELMSLIE also showed a case of a girl, aged 11 years, who, three weeks before coming to the hospital, had fallen down some steps and hurt her left foot, which was doubled under her. From that time there had been pain over the inner side of the instep. Examination showed the tender spot to be over the tubercle of the scaphoid. X ray examination of both feet showed that there was a separate ossification for the tubercle of the scaphoid on either side. On the left side the separate piece of bone appeared to be a little rough on its deep surface. The affected ankle and foot were immobilised in plaster-of-Paris for a fortnight, the plaster being removed on Oct. 30th. The case was one of os tibiale sesamoideum, in which an injury appeared to have loosened slightly the separate piece of bone on the left side and thus rendered it temporarily painful. He intended to put the foot into an outside iron, so as to throw the weight on to the outer side of the foot and so rest the scaphoid.

Dr. HENRY KELLER said that in the X ray picture the metatarsal appeared to be chipped, and this might be the cause of the pain. In children it was necessary to immobilise completely by some mechanism which could not be removed.

Infantile Paralysis with Affection of Hip.

Mr. LAMING EVANS showed the X ray photographs of the hip of a child of 5 years of age, who was suffering from Infantile Paralysis with Bi-lateral Affection of the Hip. During operation, while he was manipulating the joint with very little force, something seemed to give way in the joint. X rays showed that there was a fracture of the neck and separation of the epiphysis. He thought that the combined condition was rare and asked for diagnosis.

The PRESIDENT said that in severe cases of infantile paralysis with the bones poorly developed (as were cases requiring operation) fractures were very apt to recur.

Chronic Synovitis in Both Knee-joints.

Mr. FAIRBANK showed a case of Chronic Synovitis in Both Knee-joints. The patient was a young soldier who had had rheumatic fever in Egypt three years ago. He was ill for nine months, many joints being affected. Both knees had been swollen ever since. He was discharged from the army early in 1917. He had been treated in a number of different ways, but there had been no improvement. He had rested in bed with the knees in splints at different times; he had been allowed up, with prolonged gymnastic treatment, massage, and electrical treatment of the quadriceps. He was at Bath for four months, and had had the various forms of treatment which were there provided. Both knee-joints had been aspirated, and 5 c.cm. of ether had been injected into the right. The joint fluid was slightly turbid. Cultures were sterile. X rays showed little change in the left knee-joint, but osteo-arthritic changes in the right. The Wassermann reaction was negative. Iodides had been used without result. He asked for suggestions as to treatment, two possibilities of which were: (1) excision of the anterior portion of the synovial membrane, or (2) excision of the joint.

The PRESIDENT thought that a treatment similar to the firing of horses—light touches of the linear cautery—was worth trying. In his opinion the osteo-arthritic changes were more important than the hydrops.

Mr. W. ROWLEY BRISTOW said that he had seen many cases of synovitis due to some form of infection acquired abroad. Treatment was disappointing as recurrence was usual. Operation, he thought, would almost certainly fail. Excision would be justifiable only for severe pain. Excision of the synovial membrane was not very satisfactory. He suggested the application of a compression bandage, and that the patient should be allowed to get about.

Mr. G. N. GIRDLESTONE said that there was early osteo-arthritis, and thought that some microbial element was present. He recommended prolonged immobilisation and hyperæmia by ionisation or diathermy for six months, after which the muscles could be developed.

Mr. ELMSLIE suggested making a small incision in the joint and washing out with saline. He thought there were some loose bodies in the right joint, and possibly in the left also.

Mr. LAMING EVANS advised opening the joint and sewing the synovial membrane to the subcutaneous tissue and closing the wound. The joint would thus be drained into the tissues.

SECTION OF GYNÆCOLOGY AND OBSTETRICS.

THE RÔLE OF THE CINEMATOGRAPH IN THE TEACHING OF OBSTETRICS.

A MEETING of this section was held on Nov. 6th, Mr. J. D. MALCOLM, the President, being in the chair.

Dr. G. DRUMMOND ROBINSON gave a demonstration on the Rôle of the Cinematograph in the Teaching of Obstetrics. He said that at the present moment great interest was being taken in an effort to improve the teaching of obstetrics in London. Their society had quite recently issued a report on this most important branch of medical education, which it was sincerely hoped might do much to improve a state of things which, to put it very mildly, was highly undesirable. Any method which would assist the student to get a better grasp of this subject would be valuable. They all knew how helpful it was in any branch of study to be able actually to see what happened—if that were possible—as well as to hear and to read about it. By means of the cinematograph a process or an operation could be actually shown to as large an audience as might be desired and as often as might be necessary. By means of photographs of actual labours all that it was possible to show an onlooker of normal or abnormal labour might be demonstrated in the classroom under the most convenient conditions and by the most experienced teachers, as vividly as at the bedside. This would to some extent remedy the defect in our present system of teaching pointed out in our recent report—namely, that instruction on the actual labour case is at present left practically entirely in the hands of junior teachers. By means of animated diagrams and drawings the internal processes of development and of disease, as well as the manipulations and movements that take place unobserved during most obstetric operations, would be demonstrated to the eye. Dr. Robinson then showed the films. They comprised animated diagrams, shown successively at slow and at rapid speed, of the complete process of labour in vertex and breech presentations, from the first contractions of the uterus to the birth of the body of the fœtus. There was also an animated diagram showing the processes of the third stage of labour. The moving pictures of the natural subject included the second stages of labour in vertex and breech cases at close range and brilliantly illuminated, and also the birth of the placenta and the treatment of asphyxia neonatorum. On the completion of the films Dr. Robinson said that for the present occasion it had seemed desirable that the process of labour should be shown completely by the photographs as it actually occurred. For teaching purposes no doubt the photographs would be arranged according to the stages of labour. He had only concerned himself with normal labour, but it was obvious that such subjects as the development of the Graafian follicle and corpus luteum, the passage of the ovum along the Fallopian tube, the meeting of the ovum with the spermatozoon, the development (microscopic and macroscopic) of the decidua, the development of the placenta, the changes in size and shape in the gravid uterus, the involution of the uterus, the action of the uterine segments, ante-partum hæmorrhage, and obstetrical operations such as version, forceps, and craniotomy, could all be admirably shown. Also, by photographs of the actual subject, such operations as forceps delivery, Cæsarean section, and others could be demonstrated. The drawback to this method of teaching was the initial expense of the production of the film. The photographing of the actual subject was not unduly expensive, but in the production of animated drawings the result depended largely upon the number and character of the drawings, and as a large number of drawings was necessary this could never be cheap. However, if this method of teaching were largely adopted and a considerable number of copies were disposed of, the expense would be insignificant. He felt convinced that some individual of means could confer a great benefit on medical education and on humanity by investing a sum of money in the production of films that would illustrate the whole subject of obstetrics completely.

Discussion on the Demonstration.

Sir FRANCIS CHAMPNEYS, after expressing admiration for the films, said that in the animated diagram of the breech case the spine appeared to rotate backwards instead of forwards. He also criticised the position of the hands in tying the second knot on the umbilical cord. If the knuckles are far apart and the cord slips the results may be disastrous. In the diagram of the third stage the vagina should not have remained ballooned after the birth of the placenta.

Dr. AMAND ROUTH regretted the jerky movements of the diagrams.

Mrs. SCHARLIEB expressed great interest in the films, but commented on the dilapidated appearance of the fœtus.

Dr. HERBERT SPENCER suggested that photographs of models might have been used instead of diagrams.

In reply, Dr. ROBINSON referred to the difficulties in preparing the films and the great expense involved. Models had been tried, but had not been found successful.

INVERSION OF THE UTERUS.

Dr. SPENCER read a paper on Nine Cases of Inversion of the Uterus. The cases were as follows:—

CASE 1.—Inversion at unassisted labour; putrid placenta and membranes adherent removed on admission (nineteenth day). Under continuous irrigation with boric acid solution spontaneous reduction on forty-first day. Good recovery. Highest temperature 102·6° F., fell to 100° fourth day; normal nearly every day afterwards. Discharged thirty-first day.

CASE 2.—Inversion at unassisted labour; extreme anæmia. Seen on fifth day, uterine tissue too soft safely to permit pressure. Continuous irrigation. Aveling's repositor on eleventh day; reduction within 8¾ hours. Good recovery. Temperature on admission 101° F., second day 101·4°, third day 100·8°, afterwards below 100° except on one occasion (100·6°). Discharged twenty-ninth day.

CASE 3.—Inversion at labour, attended by medical assistant; condition unrecognised. Aveling's repositor on twenty-second day; reduction within 5½ hours. Normal afebrile recovery. Discharged fourteenth day.

CASE 4.—Inversion at labour, attended by medical assistant; condition unrecognised; extreme anæmia. Twenty-two months later advised at a hospital to have uterus removed; refused. Subsequently another doctor tried cup and straight-stem pessary for 36 hours, and again for 15 hours without benefit. Aveling's repositor applied 2 years and 8 months after labour; reduction within 44 hours. Good recovery. Highest temperature 102·4° F., gradually fell to normal. Discharged eighteenth day.

CASE 5.—Inversion at labour, attended by doctor; condition unrecognised. Aveling's repositor 9 months later; reduction in 47½ hours. Good recovery.

CASE 6.—Inversion by gangrenous sessile submucous myoma. Temperature 99·6° F. Excision of myoma; immediate reduction with fingers; iodoform gauze tampon applied for 12 hours. Good recovery. Temperature only twice reached 99°. Discharged twenty-first day.

CASE 7.—Inversion by gangrenous sessile submucous myoma. Bisection and enucleation of myoma; immediate reduction with fingers; iodoform gauze tampon for a few hours. Good recovery. Temperature only once rose to 100° F. after the operation. Discharged thirteenth day.

CASE 8.—Inversion by fundal intra-mural cystic myoma of size of pigeon's egg. Inverted organ resembled ordinary inversion except that it was twice as big as normal uterus; no line of demarcation between and no hardness where tumour was. Incision into fundus; enucleation of tumour; immediate reduction with fingers; iodoform gauze tampon for 12 hours. Good recovery. Highest temperature 99·6° F. Discharged fourteenth day.

CASE 9.—Inversion by spindle-cell sarcoma of body. Uterus bisected and removed per vaginam. Recovery. Recurrence after four months. Local removal with cautery. Recurrence.

Dr. Spencer had also seen five cases under the care of Sir John Williams, three of them successfully treated by Aveling's repositor and two by removal of the polypoid sarcoma. He protested against the modern surgical methods of treating chronic inversion, and expressed his opinion that nearly every chronic inversion of the puerperal uterus could be successfully treated by Aveling's repositor; should it fail he would prefer to operate by the abdomen. For myoma inverting the uterus excision of the myoma was usually sufficient, the uterus being afterwards easily replaced. For sarcoma inverting the uterus hysterectomy and radium or X ray treatment were called for.

Discussion on Dr. Spencer's Cases.

Sir FRANCIS CHAMPNEYS said that the series of cases was unusual in that five out of the nine were complicated. The salient features of uncomplicated cases were the complete involution of the uterus, the fact that the inversion was no more difficult to replace after several years than after a few months, and that Aveling's repositor never failed.

Dr. M. HANDFIELD-JONES said that shock was by no means always present, and quoted two cases in which the inversion had not been diagnosed for some time after it had taken place.

Dr. AMAND ROUTH said that in cases where shock was not a prominent symptom the inversion had probably been partial only at the start. He always used Aveling's repositor.

Dr. SPENCER briefly replied.

NORTH OF ENGLAND OBSTETRICAL AND GYNÆCOLOGICAL SOCIETY

AT a recent meeting held at Liverpool, with Mr. MILES PHILLIPS, the President, in the chair, Professor J. MUNRO KERR, of Glasgow, opened a discussion on

The Cicatrix of the Uterine Wound in Cæsarean Section.

He put forward the following reasons why the ordinary longitudinal incision should be considered as unsatisfactory: 1. The scar was inevitably starved, because sutures were used both as hæmostatic agents and coaptors; satisfactory coaptation was difficult to secure because the sheets of muscle in the uterine wall were irregularly distributed, and the uterus was in a state of unrest (normal contraction) and of involution; and (3) blood tended to collect between the raw surfaces leading to a more or less broad band of fibrous tissue, which might stretch or give way in a subsequent pregnancy. He suggested three alternatives to the ordinary through-and-through sutures after delivery of the placenta: (1) Immediate suture after delivery, while the uterus was in a state of rest and before the placenta was delivered—this being left to pass through the cervix; (2) suture in layers; (3) delivery through a low transverse incision in the lower uterine segment, assisted by the Trendelenburg position, with expression of the child by a hand behind the fundus. The cord was to be replaced in the uterus and the placenta allowed to deliver itself naturally. He had practised this method, which led to very little bleeding, for the last two years, and strongly recommended it. The only pertinent objection that he could see was the possibility, in suspect cases, of the gravitation of deleterious material towards the uterus.

Discussion.

A discussion developed which was notable for a frankly expressed distrust of the lower uterine segment and for confidence in the more usual incision, provided certain precautions as regards technique were observed.

Professor HENRY BRIGGS (Liverpool) advocated that suturing with catgut in horizontal layers should be begun as soon as the child was delivered, while the uterus was at rest, and that the incision should be a small and longitudinal one.

Dr. J. E. GEMMELL (Liverpool) sutured a high vertical incision with three layers of catgut, while Dr. E. O. CROFT (Leeds) preferred fine silk.

Dr. HAROLD CLIFFORD (Manchester), who adopted through-and-through catgut sutures, omitting the mucosa, with chromic catgut superficially, was supported by several members in his contention that the lower uterine segment was essentially weak, became more so during the course of a protracted labour, and was thereby an inauspicious site for incision.

Details from various clinics were put forward by members who did not consider there was sufficient evidence that a longitudinal incision in the contractile portion of the uterus was less satisfactory than one in the lower uterine segment.

Professor MUNRO KERR briefly replied.

ULSTER MEDICAL SOCIETY.

THE opening meeting of the session 1919–20 was held in the Belfast Medical Institute on Oct. 30th. After a short valedictory address from Dr. JAMES COLVILLE, the retiring President, to whom a cordial vote of thanks was passed, Mr. A. FULLERTON, the incoming President, delivered his presidential address on

Recent Work on Shock and Hæmorrhage.

After reviewing at some length the work done during the war in France, America, and England on shock, Mr. Fullerton said that certain conclusions appeared to be justified in the state of our present knowledge. Wound shock might be defined shortly as that state of depression of the bodily functions which is produced by wounds received in warfare. In civil practice injuries and surgical operations might be taken to represent "wounds." Shock might be divided into primary and secondary shock. Primary shock, the nature of which is as yet undefined, comes on immediately after injury. Secondary shock comes on gradually, the degree depending to some extent on the care of the injured man during transit. Recent investigations have confirmed none of the theories as to the causation of shock except that it appears to have been produced in certain cases by absorption of metabolites from injured tissue, especially muscle. After commenting on the low blood pressure, which is one of the outstanding features of shock and the contributory factors in its production, Mr. Fullerton spoke of the great importance of preventive treatment of shock, and then went on to describe the treatment of the established condition. Since toxic products from injured tissue, especially muscle, can produce shock, all dead and damaged tissue should be removed as early as possible. The main object in the treatment of shock is to restore the blood pressure; the most successful agents are warmth and rest. The administration of stimulants found very little favour in France and strychnine had long been abandoned.

Mr. Fullerton condemned the use of vaso-constrictors, glucose solutions, subcutaneous saline, and intravenous injections of simple isotonic or hypertonic saline as useless or only of transient benefit. Calcium salts when added to solutions for intravenous injection do not lessen the tendency of the fluid injected to escape, and alkaline injections have been abandoned. The only intravenous injection of any lasting value was that of solutions which did not leave the blood-vessels, of which the most suitable appeared to be Bayliss's gum saline solution. This was a 6 to 7 per cent. solution of gum arabic in 0·9 per cent. sodium chloride. It had the viscosity of blood and the osmotic pressure of its colloids. It had had an extensive trial in France, and the reports were favourable. Bayliss found that in animals even when severe hæmorrhage had taken place restoration might be produced by gum saline solution alone. In cases of severe hæmorrhage it might be used with blood to economise the latter. It had to be used early and before the low blood pressure had had time to cause a loss of excitability of the bulbar centres.

It was not till 1916 that blood transfusion was used to any great extent by British surgeons in France. The arrival of the American surgeons in 1917 gave a fillip to its use, and in the later stages of the war it had a great vogue. Of the two methods in use the direct method was described in detail by Bazett, Dreyer, and Fullerton.[1] This method required more skill than the indirect methods, and the quantity of blood transfused was not easily determined. Of the indirect methods paraffined tubes of 400 to 500 c.cm. capacity were much used in France, as were also record syringes with Lindemann's cannulæ. Citrated blood transfusion was used extensively, and the work of Rows and Turner, published in 1916, initiated the use of preserved blood corpuscles. Blood from a donor was received into a mixture of dextrose and citrate of sodium solutions which was isotonic, and the blood corpuscles allowed to settle. In four or five days the blood was available for use. The supernatant fluid was drawn off and the sediment of corpuscles mixed with a 2·5 per cent. solution of gelatin in normal saline. Good results were obtained by this method, and the preserved blood corpuscles could be kept in good condition for several weeks, and could be transported considerable distances without damage to the red cells. In the later stages of the war tests of compatibility were always carried out. Moss's classification of donors was used. Roger Lee, of the United States Army, showed that it was only necessary to test the serum of the recipient against the cells of the donor. The serum of the donor was diluted in the blood of the recipient and did not cause agglutination or hæmolysis of the latter's corpuscles, which were in addition protected by their own plasma.

The President concluded by illustrating the use of blood transfusion in civil practice by giving particulars of several cases in which he had employed the method.

On the motion of Professor J. A. LINDSAY, seconded by Colonel T. SINCLAIR, a vote of thanks was accorded Mr. Fullerton. It was decided to elect as an Honorary Fellow Sir James Mackenzie. The annual dinner of the society is fixed for the evening of Wednesday, Dec. 3rd.

[1] THE LANCET, 1917, i., 715.

LONDON ASSOCIATION OF THE MEDICAL WOMEN'S FEDERATION.—A meeting of this association was held at 11, Chandos-street, on Nov. 4th, Dr. Emily Flemming, the President, being in the chair. The subject for discussion was Work in the Mediterranean Area, and several members who had been attached to the R.A.M.C. during the war gave an account of some of their experiences.—Dr. Elizabeth Lepper gave particulars of a fulminating case of cerebral malaria in which the symptoms began four hours before death took place, and showed microscopical preparations from the post-mortem material. She then described a case of black-water fever and one of liver abscess secondary to amœbic dysentery. Specimens and slides from both cases were shown.—Dr. Dorothy Hare reported on cases of paratyphoid fever occurring in Malta in the later months of 1916. The cases were all of mild uncomplicated character, and the chief interest lay in the diagnosis. The difficulty of basing a diagnosis on agglutination tests alone in inoculated patients was emphasised.—Dr. Elizabeth Hurdon (Baltimore) described some of the cases under her care in Malta and Salonika. She referred to the difficulties in diagnosis between malaria and dysentery, and in dealing with the mixed infections.—Dr. Effie Craig gave an account of her work in Malta and Salonika, referring to the great prevalence of malaria and scurvy among the Serbs.—Dr. Mary Blair described some of the features of life in a camp and the way in which infection was avoided in cases of dysentery. No cases occurred during the winter months among the hospital staff in the camp to which she was attached.

WEST LONDON MEDICO-CHIRURGICAL SOCIETY.—A clinical meeting of this society was held at the West London Hospital on Nov. 7th, Mr. Herbert Chambers, the President, being in the chair.—Cases were shown by Dr. E. Arthur Saunders of Rheumatoid Arthritis with excessive affection of the right knee associated with pyorrhœa and tabes dorsalis with Charcot joint (right knee).—Mr. Laming Evans showed a most interesting and successful case illustrating the result of a free fascial transplant replacing the extensor tendons of the wrist. Before operation the patient, an officer wounded by H.E. casing, had complete loss of extending power in the long extensors of the third, fourth, and fifth fingers at the metacarpo-phalangeal joints. On Jan. 3rd, 1919, six months after the wound, the proximal ends of the extensor tendons and the distal ends of the extensor muscles were exposed. Seven inches of intervening scar tissue was excised, and a free fascial transplant 8 in. long from the left thigh was laid as one piece in the prepared bed and was sutured by catgut to the muscle belly above and the tendons below. He was afterwards treated by massage, faradism, baths, and education. As a result he now has good independent action of extension of the third, fourth, and fifth metacarpo-phalangeal joints, although no attempt was made to connect the proximal ends of the tendons by separate slips to the muscle belly. Mr. Evans considered that the single transplant minimised adhesions and gave the best chance for subsequent independent action.—Mr. O. L. Addison showed a case of a woman one year after interscapulo-thoracic amputation (La Contes' method) for sarcoma of the upper end of the humerus. There had been no recurrence.—Mr. Addison showed also a woman with Chronic Ulceration of the Tongue. Wassermann's reaction was a partial positive, but two injections of novarsenobillon were given without effect on the ulcer. There were no signs of malignancy, and it was suggested that the ulceration might be tuberculous.—Dr. F. HALLS DALLY showed a case of a boy of 15 with Asthma and Emphysema in association with Generalised Adiposis and Delayed Development, which Dr. Arthur Saunders suggested was due to defects of the pituitary gland and probably deficiency of the other internal secretory glands.—Dr. J. BURNFORD showed cases of: (1) Cyanosis with Polycythæmia and Congenital Heart Disease. Red corpuscles 11,600,000, hæmoglobin 140 per cent.; (2) Elephantiasis, of unknown cause, of both legs in a woman aged 45; and (3) Raynaud's Disease in a woman aged 28.

Reviews and Notices of Books.

Dementia Præcox and Paraphrenia. By Professor EMIL KRAEPELIN. Translated by R. MARY BARCLAY, M.A., M.B. Edited by GEORGE M. ROBERTSON, M.D., F.R.C.P. Edinburgh: E. and S. Livingstone. 1919. Pp. 331. 15*s.*

LAST July, after the interesting lecture on the Psychogenesis of Mental Disease given by Professor Jung at the Royal Society of Medicine, there was a good deal of discussion about dementia præcox. One held that the case cited by Professor Jung [1] was not a case of dementia præcox at all. Another laid emphasis on physical stigmata as against the psychical changes emphasised by the lecturer. Dr. Henry Head declared that no such thing as dementia præcox existed. Professor Kraepelin is the first champion of this questionable "clinical entity," though, as Dr. Robertson points out, the "secondary dementia of adolescence," described by Clouston so long ago as the year 1888, must be considered as at least a prophecy of Kraepelin's work. Many who have read the author's clinical lectures translated into English, and who remember his power of keen observation and lucid expression of thought, will turn with interest to this chapter from the eighth German edition of the "Text-book of Psychiatry." They will not be disappointed. In nearly 100 pages devoted to the clinical forms of the disease they will find again many incisive pen pictures of mental conditions and an abundance of corroborative detail. Yet we venture to believe that they will find no sufficient answer to Dr. Head's agnosticism.

What is the characteristic feature of dementia præcox? Is it dementia? Professor Kraepelin lays increasing emphasis on this aspect of the disease. His former classification into the hebephrenic, catatonic, and paranoid groups was, he says, undoubtedly inadequate. The present classification is based mainly on various types of dementia—the simple, the silly, the simple depressive, the delusional depressive, and so on. And yet it is admitted that a certain number of cases of dementia præcox do attain to a complete and permanent recovery. The connexion with a youthful age-incidence is even less constant. True, there has been propounded a theory in which it is claimed that those cases which appear to begin late in life have in reality commenced much farther back and have developed insidiously through months, years, and even decades. This theory is not, in the author's own opinion, supported by any sufficient evidence. The attempt to delimit the entity is not more successful than the attempt to christen it. In the volume under review one group of cases is considered as belonging to the "endogenous dementias," but is separated from the dementia præcox group on account of the "far slighter development of the disorders of emotion and volition." It is relegated to a separate chapter at the end of the book under the title of paraphrenia. Paraphrenia, dementia præcox, and true paranoia are all said to develop from a paranoid condition, which in the early stages does not admit of this differentiation. The author himself is clearly not satisfied with his present means of deciding into which partition every individual case shall be placed. The chapters on psychic and bodily symptoms form a kind of epitome of the varieties of symptoms described in the rest of the book. It is perhaps surprising that in so comprehensive a work more attention is not given to the very common phenomena of echolalia and echopraxis. An exp'anation is suggested for the causation of negativism in opposition to the theory of Bleuler, who stresses the influence of emotional conflict. Kraepelin regards negativism as resulting from the delusions of compulsion from which these patients suffer, but many psychologists will think that he has not carried his inquiry far enough.

Perhaps the most interesting section of this book is that which deals with the cause of these dementias. Many possible origins are considered; among them is noted as "much more important than the physical signs of degeneration" the fact that "in a considerable number of cases psychic peculiarities have come under observation in our patients from childhood up." Professor Kraepelin will not admit, however, that Jung has proved a case for the psychogenesis of this disease. If the destructive toxins are, as Jung suggests, developed through emotion, why is it, he asks, that the manic depressive cases with their violent emotions do not produce these toxins in the greatest quantity? We wonder whether Professor Jung would retort that the emotional energy of an affective state must not be measured by its conative counterpart!

So the spirit of controversy breathes through almost every page and makes the whole work intensely interesting. It is a valuable addition to our English library, and it will contribute, as Dr. Robertson hopes, to a better understanding of these cases, which make up an eighth of all the admissions to our asylums.

[1] See THE LANCET, July 19th, p. 109.

A Text-book of Surgery for Dental Students. By G. PERCIVAL MILLS and HUMPHREY HUMPHREYS. Second edition. With 57 illustrations. London: Edwin Arnold. 1919. Pp. 340. 14*s.*

THE curricula for the various diplomas in dental surgery require that the student should have a general knowledge of the principles of pathology and surgery, and should possess a fair acquaintance with the surgery of the jaws and associated parts. In the past the student has only been able to obtain this knowledge by consulting the ordinary text-books of surgery, which include subjects that have no bearing upon the speciality of dentistry. This difficulty of the dental student has been smoothed away by the authors of the present book, for they have produced a text-book on surgery containing all the information that is necessary to enable him to practise his calling in an intelligent manner.

The book might, perhaps, be made still more useful by the introduction of a chapter on minor surgery and an account of the technique of aseptic operations. The method of performing the operation of laryngotomy should be understood by everyone practising dental surgery, and we think the authors might well include a detailed account of this operation in the next edition. The section on Fractures of the Jaws would be of greater value if the more recently proved methods of treatment were described. In the present edition very few alterations have been made, and the general scheme is similar to that of the first edition.

Hygiene and Disease in Palestine in Modern and Biblical Times. By E. W. G. MASTERMAN, M.D., F.R.C.S. London: Palestine Exploration Fund. 1919. Pp. 70. 2*s.* 6*d.*

DESPITE its small size and unpretentious appearance this little book contains a vast amount of interesting information. Palestine has always been, and will continue to be, a land which is very much in the minds of men on account of its religious and political history. And as it may chance that in the future the British Empire is to be the preponderating influence in the land, the health of its inhabitants should be a matter of concern to all Britons. Dr. Masterman probably knows Palestine from the medical point of view better than any other man living, and the eight chapters of the book are reprinted from the quarterly statement of the Palestine Exploration Fund, a society which has done much to throw light upon biblical problems. Part I. of the work deals with the diseases of modern Palestine and Syria, and Part II. with diseases of the Bible. There is also an appendix upon the water-supply of Jerusalem as it used to be and as it has been since the British occupation. This gives a most interesting account of the improvements effected by our Royal Engineers within some six months of their arrival. Chapter IV. treats of ideas among the natives regarding disease, which are mainly derived from primitive folk-lore and mediæval medicine, together with certain beliefs connected with the orthodox religions of the land. Dr. Masterman points out a fact which is well known but not sufficiently recognised by many—namely, that it is impossible to say definitely what was the biblical disease called in the Hebrew "zar'ath" which has been translated leprosy. The word probably was used to describe a number of different skin diseases, but, whatever the disease or diseases were, it was not modern leprosy. Altogether the book is one to be read and pondered over by all who realise the responsibilities of their position as subjects of the British Empire.

A Treatise on Regional Surgery. By Various Authors. Edited by J. F. BINNIE. Vol. II.: Genito-Urinary Section. London: H. K. Lewis and Co. Pp. 656. 32*s.*

THE second volume of this treatise is divided into four main sections, viz.: The Kidney and Ureter, by W. E. Lower; the Bladder, by E. Rhuyminck; the Disease of the Prostate, by C. O. Gibson; and Diseases of Injuries and Deformations of the External Male Genitalia, Seminal Vesicles, by E. O. Smith, and may be recommended to our readers though the subjects are not uniformly well treated, and in some parts the points of interest are ill-defined. However, the whole is a good résumé of genito-urinary surgery at the present time.

One of the striking features is an article written about horseshoe kidney, which is not universally regarded as being a causative factor of symptoms such as are suggested by the author. The subject of renal tumours is little noted, which is unfortunate when it is one which is demanding the attention of genito-urinary surgeons at the present time. An essentially practical article upon the surgery of the bladder contains much valuable information for the general practitioner. The article on gonorrhœa is so short as not to deal fairly with its topics.

The illustrations are very good, and the letterpress is well printed.

White and Martin's Genito-Urinary Surgery and Venereal Diseases. By EDWARD MARTIN, BENJAMIN THOMAS, and STIRLING MILLHEAD. Eleventh edition. London: J. B. Lippincott Company. 1919. Pp. 936. 30*s.*

THE fact that this volume was first published in 1897, and has since gone through eleven editions, speaks for it. It covers the whole work of genito-urinary surgery, including venereal diseases, and is quite up to date, containing information which is not usually found in many published works on these subjects. It is essentially a practical book, and, so far as we are able to discover, omits no needful thing.

The illustrations are disappointing in many places, especially those which are designed to demonstrate the appearances seen in X ray photographs. This is unfortunate, as pyelography is a subject which is more and more calling for attention. In future editions this may be improved. Many of the plates are very good indeed, especially those illustrating the appearances in the bladder as seen by a cystoscope, though they suffer rather from their small size.

One of the features of the book is the care which is taken in differential diagnoses. Some 300 pages are devoted to the diagnosis and treatment of syphilis. All the more modern methods are fully discussed. This book should have a popular reception.

Anæsthesia in Dental Surgery. By T. D. LUKE and J. S. ROSS. Fourth edition. Illustrated. London: William Heinemann. 1919. Pp. 255. 8*s.* 6*d.*

THIS book deserves its continued popularity as a guide to those who are called upon to administer anæsthetics for dental surgery. The present edition contains additional short chapters on ether and chloroform; but the chief value of the book remains its explicit directions for the use of nitrous oxide, its descriptions of the necessary apparatus, and its valuable practical hints for the use and the keeping of the same. Local anæsthesia is also fully treated. The authors might, we think, be more decisive in their opinion against the use of this method when inflammation or actual suppuration is present.

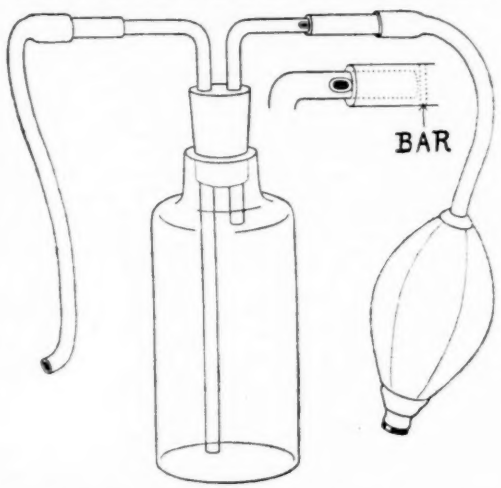
JOURNALS.

THE leading general scientific journal, our esteemed contemporary, *Nature*, reached its jubilee issue last week, and we heartily join in the congratulations received from all sides by the founder, Sir Norman Lockyer, the editor, and his staff. An extremely interesting special number celebrates the event. It contains a series of articles by well-known authorities on the progress made during the past 50 years by every branch of science. It is interesting to learn that four of the contributors to this symposium—namely, Sir Archibald Geikie, Sir E. Ray Lankester, Professor T. G. Bonney, and Canon Wilson—were contributors to *Nature* from its inauguration. Sir Norman Lockyer writes an interesting account of the birth of the journal, and this is succeeded by a sketch of Lockyer's scientific career by M. H. Deslandres, Vice-president of the Academy of Sciences of Paris, and Director of the Astro-physical Observatory of Meudon. Other writers in their own special fields of study include Sir T. Clifford Allbutt, Sir E. Sharpey Schafer, Dr. C. J. Martin, Dr. A. Smith Woodward, Professor Hugo de Vries, Professor W. Bateson, Professor J. Cossar Ewart, Sir Edward Thorpe, Professor Henry E. Armstrong, Professor H. B. Dixon with H. Stephen, Professor J. C. Philip, Sir J. J. Thomson, Sir Ernest Rutherford, Professor Frederick Soddy, Professor J. S. Townsend, Professor A. Fowler, Professor W. H. Bragg, Dr. A. C. Jordan, Professor A. J. Fleming, Dr. W. C. Unwin, Professor H. C. H. Carpenter, L. Baistow, Professor C. H. Lees, W. H. Dines, Sir John Scott Keltie, R. Chapman Jones, Emery Walker, Sir William A. Tilden, Dr. Alex. Hill, J. H. Reynolds, and Sir Richard Gregory. Truly an all-round testimony to the high esteem in which *Nature* is held by the pioneers of scientific work in all its branches.

New Inventions.

A SAFETY CHLOROFORM INHALER.

THE form of Junker's inhaler shown in the figure is designed to prevent the pumping of air through the apparatus in the wrong direction; it is impossible for liquid chloroform to be delivered into the face-piece. The metal exit-tube coming from the stopper of the bottle has an aperture in the side. The metal nozzle attached to the bellows is provided with a bar passing across its lumen, which prevents the nozzle from being brought sufficiently far over the exit-tube to close the aperature in it, while the



nozzle attached to the face-piece, having no bar, passes over and closes this aperture when pushed home. If the apparatus be wrongly put together, and the bellows brought into action, the air pumped in escapes through the hole; the pressure in the bottle is not raised, and no liquid is driven over. The apparatus is represented in the figure as wrongly put together.

The inhaler is made by Messrs. Maw, Son and Sons, 7, Aldersgate-street, London, E.C.

E. L. KENNAWAY, M.D., D.Sc.
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ROYAL DEVON AND EXETER HOSPITAL.—At the quarterly meeting of the governors of this institution, which was held last week, the chairman, Sir Chaning Wills, stated that a contract had been signed for £30,000 for the extension of the hospital. £10,000 had been given by the British Red Cross Society, £2000 by the Government, and £10,000 had been already subscribed. The chairman added that it was confidently hoped that the additional funds required would be raised. The enlargements of the hospital will give accommodation for 100 additional beds, and also provide for the treatment of discharged disabled sailors and soldiers.

THE LANCET.

LONDON: SATURDAY, NOVEMBER 15, 1919.

The Behaviour of Influenza.

THE recent outbreak of catarrhs, the change in the season, and the passing of the fine weather, combine to bring more vividly to the public mind the recent experience of the influenza epidemic, and to raise fears of a return of the dreaded pestilence. For catarrh, season, and weather are—and with reason—associated, not only in the lay, but also in the medical, mind, with influenza. Two significant questions frame themselves readily in connexion with the matter: Is another epidemic of the disease probable? and, Have we learnt from the experience of last autumn and winter anything of value in checking the epidemic, should it arrive? The answers to both questions, it must be confessed, are unsatisfactory, and yet they are not without some elements of comfort. So far as the question of a likely return of the disease in epidemic form is concerned, it is interesting to note that the same phases of case-incidence and of morbidity that were presented by the epidemic of 1889–91 have been closely repeated by the epidemic of 1918–19. These phases have consisted of a period of mild scattered outbreaks, then a very severe and almost universal epidemic, and then a rapid dying down of the specific disease, but with a period of raised virulence of the secondary infecting agents, leading to high incidence of respiratory affections and of other maladies having close association with the true influenza. It is, perhaps, not unreasonable to hope that the relative freedom from anything like a large wave of incidence of the disease proper, which followed the earlier epidemic, may be our lot now. The occurrence of sporadic cases, the occasional occurrence of local epidemics, and the increased prevalence of severe pneumonias and of other allied infections which followed the general epidemic of 30 years ago, will doubtless be seen—indeed, this phase is now actually occurring; but this is one of the known features of epidemic influenza, and must be distinguished clearly from the true waves of specific incidence. The increase in virulence of the secondary infecting agents as the result of their passage through the influenzal patient, climatic conditions, and increased susceptibility of the community, are the postulates by which this particular phase may be explained. Consideration of these facts should serve to check the alarm that is prone to arise in the presence of an increased number of catarrhal affections and of scattered cases of influenza, the existence of which does not of itself give any real ground for fearing an epidemic of the disease

The meagre character of the data available to the epidemiologist from which to predict an epidemic of influenza doubtless forbids our saying more than this. And careful study of the statistics of the subject warns us also. In THE LANCET of Nov. 8th Dr. JOHN BROWNLEE,[1] as the result of such a study, and dealing with the records between the years 1889 and 1917, points out two striking facts: (1) epidemics of influenza are of extreme rarity between the end of June and the beginning of December; (2) the periodicity of influenza epidemics is very constantly 33 weeks, the epidemic being "missed" if due in the autumn. Prediction based upon these two facts would have been falsified, as Dr. BROWNLEE points out, by the great epidemic of October, 1918, for this was an autumn month, while it should have been followed by an epidemic last June, unless we consider that this was "missed." If, now, the glaringly aberrant epidemic of October, 1918, follows the same periodic law, the next epidemic is due in January–February, 1920. Let us hope that there will be a negative aberration upon this occasion as there was a positive aberration two periods ago, but should this occur only the non-thinking among us will consider that an argument has been furnished against the value of medical statistics. In the minds of some there is, no doubt, a hope that improvement in the general conditions of living following upon the cessation of the war may act as a deterrent factor in regard to a fresh epidemic; the more intense part of the nerve strain is over, exposure and excessive fatigue are much reduced, and food is both better and more abundant. But is it a fact that the bad food conditions, the nerve-strain, the exposure, and the fatigue of the war-time were ætiological factors of much, or of any, consequence in determining the recent epidemics? It seems quite doubtful if they were. It has never been shown that, as the result of these bad conditions, sickness was more rife than usual just prior to the arrival of the 1918 epidemic, and such an experience might surely have been expected were the civilian health so undermined as to raise the susceptibility to infection. Again, the fact that the maximum morbidity and the maximum mortality fell upon young adults of both sexes is another point against such a view, seeing that at this age the adverse conditions referred to could be better tolerated than in children and in the elderly. Bearing upon this same question is the observation that in Switzerland, where food was not so scarce nor the general strain so severe, the mortality was higher than in Germany, where food was scarcer and anxiety greater. The hope that improved general conditions give any guarantee against a fresh epidemic, therefore, is perhaps somewhat elusive.

Turning to the second question—whether or not we have, during the experience of the last epidemic, made any advance in preventive methods which will serve us in good stead against the next—the answer is again unsatisfactory in the general sense, though not without some qualification in particular points. We are still without certain knowledge of the causative agent in the disease; indeed, we had less certain knowledge when we emerged from the last epidemic than we thought we had when we entered it. On both bacteriological and clinical grounds the historic claim made for Pfeiffer's bacillus is much less secure than it was 18 months ago. In the opinion of many who have a right to express a view, this claim is almost entirely discounted. And no other single microbic element has as yet established a claim that attracts really responsible adherents. It follows that measures of specific immunisation

[1] In this interesting article (see THE LANCET, Nov. 8th, p. 856) a small correction is necessary. In the last paragraph Dr. Brownlee is made to say, "from March 1st to Oct. 1st is also 33 weeks": the second date should, of course, be Oct. 21st.

are very much in abeyance. In favour of the various formulæ for vaccines to be used as prophylaxis "against influenza," the most that can be said, when the evidence is calmly weighed, is that their employment probably confers some degree of temporary immunity against serious grades of infection by the secondary invaders in the disease. No small gain to the patient when the time of stress arrives, let it be granted, but scarcely justifying the enthusiasm of some optimists, the differences between whose injections provide a powerful argument against the specificity of the remedies. Yet it is to some kind of specific immunisation that we look forward, sooner or later, for protection. And it is just as well to remind ourselves that this does not mean that we must necessarily wait for the full elucidation of the bacteriological problem. The earliest of all methods of preventive treatment in infectious diseases has rendered small-pox a curiosity rather than a dread in this country, and we still remain ignorant of the essential nature of the virus.

It is obvious that our need is more knowledge, and this is to be gained only by strenuous research in the laboratory and in the field, and by careful observations of the characters of the epidemics at various places. Here data are daily coming to hand. The annual public health reports for 1918 are becoming available for study, and last week we published notes upon the reports of the medical officers of health of Brighton and of Ealing, selecting for notice the references to the behaviour of influenza. This week we publish similar notes from the reports of the medical officers of Salford and Liverpool. The reports, while they perhaps add no striking fact to what is already known, do emphasise and confirm some very important points, and help to clarify a situation that is still very perplexing, alike to the epidemiologist, the bacteriologist, and the clinician. Dr. DUNCAN FORBES notes the fact that of 271 deaths occurring in Brighton 159 were in bed from the day of onset of the disease, and over 200 were in bed by the second day; showing that in this epidemic the majority of the severe cases were severe from the onset. Dr. FORBES'S study of the disease in the Brighton secondary schools gives suggestive details on the question whether or no one attack confers immunity against subsequent attacks. In an investigation of over 1000 children it is seen that one attack protects to a certain extent only against later attacks, and that a second attack in any one year is quite probable. At Ealing Dr. THOMAS ORR noted the rapid recovery of the school children first affected. Dr. E. W. HOPE traces the introduction of the severe form of the disease into Liverpool by means of shipping, the actual contacts being coloured seamen and American troops. Soldiers who were acutely ill were transferred to hospital, but convalescents, who were probably still infectious, mingled with the general population. The crews, too, were affected, and the great pressure upon the hospital beds made it impossible to obtain accommodation for these cases. Dr. C. H. TATTERSALL finds that at Salford healthiness, or otherwise, of occupation had apparently little influence upon the death-rate. Facts of this sort, collected over large and differing areas, may at any moment when compared, be found to tell a fruitful story, and we recommend to our readers the study of the reports of the medical officers of health as they become available.

Concerted Anti-Venereal Effort.

VENEREAL disease is now recognised as a grand factor in destroying the health and happiness of the community, and it is natural that a section of the medical profession should be keenly interested in the discovery of the most potent methods for combating it. In the last few weeks a process of crystallisation has set in with regard to the two most prominent attempts at the solution of the problem. On the one hand, there is the medico-physical group, whose task is to discover whether it is possible by medical methods to prevent the contraction of venereal disease, and then to ascertain what method is most likely to prove successful. Should the primary question be answered in the affirmative they would proceed to induce the community by all available means to utilise the method found successful. The artifice which holds the field at the present time is that known as "early disinfection" or the provision of disinfecting material to be utilised at the time of exposure to risk of infection. Solid grounds are given for believing that this method used under ideal conditions would markedly diminish the incidence of venereal disease and avoid much suffering to participators and non-participators. It would be a simple matter to render the necessary materials easily and economically available to the community at large. But the proceeding to the minds of many would be of sinister import, the fear being that many individuals, hitherto restrained from promiscuous intercourse by caution or fear, would now transgress, buoyed up by a hope of safety, which, through inefficiency, would prove but a phantom. On this view the promulgation of measures intended to be protective to the community would, especially among the more untutored classes, result in propagating disease rather than in preventing it. The view assumes a belief in the potency of fear as a deterrent factor. We may express a doubt whether among the less educated classes fear holds back many from indulgence. Fear may restrain for a while, but it is not an abiding factor, and eventually the brink is overstepped, with added danger should no preventive measures have been taken. To make fear—or its twin sister, ignorance—part of the programme is, we feel, neither in the interest of a hardy morality nor of ultimate hygiene. Secondly, there is the physico-ethical group, whose object is the reduction of venereal disease without endangering the ethical standard. To them early disinfection is an incentive to vice in the case of those restrained by fear. They find a via media in the shape of clinics for early treatment. There is here, it is claimed, not the same incentive to vice as exists when protective material can be carried about, but, alas, time is lost between exposure to risk and attendance at a clinic. Appeal has been made to statistics on both sides, without carrying much conviction.

This being accepted as a brief but fundamental survey of the position, the urgent question to decide is: What policy does it behove the nation to put into practice in order to secure a greater degree of freedom from venereal disease? We believe that, although the differential value of self-disinfection on the one hand and early treatment on the other has not yet been definitely ascertained,

yet there is no doubt that both methods can be so developed as to produce a marked immunity from disease. It is a real misfortune that to so many the solution of the problem seems to depend upon the selection of one or other of these methods. Temperament is many-sided, and both policies, in some perfected form, may find their proper application. It can hardly be doubted that there are great masses of persons, calmly contemplating venery, who could and would efficiently utilise the method of self-disinfection, and for whom no other means of securing safety is ready. There must remain unnumbered others who would not for various reasons—inebriety, for example—utilise these methods. For such negligents safety lies in the clinics for early treatment. In the thoughtful article by Dr. DOUGLAS WHITE, which we published last week, the author shows a catholicity of view too seldom brought to bear on the investigation of this problem. It is to him not merely a medical question of the relative bactericidal values of chemicals, but a social question of the ultimate effects of a line of social policy. Antiseptic values being settled, he says, the medical man, as such, is no better qualified than other persons of intelligence to determine how or whether such knowledge can be effectively introduced into social life. Where the medical profession can be of special help is, we agree, in its practical knowledge of sex-psychology and of the hygienic aspect of sociological relations. The Ministry of Health has associated with it medical men and others possessing these qualifications. Immediate action is desirable in the following directions. The best technique for the administration of self-disinfection needs to be worked out. Opportunities for early treatment should be increased and elaborated. A desirable method of instructing the public in these methods should be devised. Knowledge should be promulgated so as to apply most incisively to those who by habit or determination stand in need of it, but all propaganda must be devoid of suggestiveness.

It will be asked: Are there no other methods of ameliorative or preventive power? There are indeed. Dr. WHITE refers to Colonel L. W. HARRISON'S endorsement of the value which he attaches to the "improvement of social conditions and encouragement of games." There is no doubt such factors are potent for good and their further development is of the greatest importance. Another factor which has only recently been receiving a modicum of the attention which it should receive is sex education. The effect of its wise development upon the lives of the young and as a prevention of venereal disease in the future we believe to be immense; it will avail little, however, with existing frailty. All agree with Dr. WHITE that there is no royal road to freedom from venereal disease. There is a long straight hill to climb. But the means are already to hand by which the climbing of the hill may be rendered easier and quicker. Briefly they are: (1) opportunities for self-disinfection; (2) the provision of early treatment centres; (3) the provision of better social conditions; (4) hygienic education, especially as regards the sexual factor; (5) the provision of some form of compulsory notification. Some of these measures will appeal with more force to one class, and some to another class. But all these factors are complementary, not antagonistic. Each must ply the lever which he best can work, and so enable the Ministry of Health to formulate a scheme to coördinate the whole mechanism.

Naval Medicine—Then and Now.

ON Monday evening last Surgeon Rear-Admiral Sir ROBERT HILL, Medical Director-General of the Navy, as President of the War Section of the Royal Society of Medicine, gave a presidential address before a large meeting, who listened with attention to a retrospect of naval medical conditions, which ranged through Nelson's battles and concluded with an analysis of the casualties at the battle of Jutland. At the battle of Camperdown, in 1797, the total force was 8221, and the percentage of casualties was 10·03, 203 being killed and 622 being wounded. At the battle of the Nile, in the following year, the total force was rather less—namely, 7985—while the percentage of casualties was slightly higher, 11·22, 218 being killed and 678 wounded. At the battle of Trafalgar, in 1805, the total force was 17,772, the figures being obtained from the Admiralty Muster Books, and the percentage of casualties was 9·51, 449 killed, and 1242 wounded. At the battle of Jutland, in 1916, the total force of the Grand Fleet engaged was about 60,000, and the percentage of casualties was almost exactly that at the battle of the Nile—namely, 11·14—but the figure is terrible on analysis, for of the 6688 casualties over 6000 were killed outright or drowned, the total wounded amounting to only 674. This pathetic reversal of ratio between killed and wounded was, of course, due to the sinking of four battle-cruisers, and it is to the analysis of the figures of the wounded that we must look to gauge the part played by medicine in the terrible circumstances of a modern naval battle. At Jutland we find that of the 674 wounded by shell, burning, and gas-poisoning, singly or in combination, only 74 died, and this result may be quoted to show that the naval doctor of to-day, though the environment of battle is more perilous to him and to his patients, will emerge with triumph from the ordeal. But he requires all the help that science can give him, and every chance of coöperation with medical colleagues.

In the whole-hearted manner in which medical men from all parts of the United Kingdom and Overseas joined up with the Naval, Military, and Air Forces during the war, Sir ROBERT HILL saw two things for the future. The new section of the Royal Society of Medicine, he said, would provide opportunities for reunions that would be fruitful in exchange of experience; and, secondly, a medical organisation could in this informal way be constructed, upon which, at need, the three combatant services could call when it became necessary to augment their ranks, and to distribute the strain upon any one branch throughout the medical personnel of the country. He frankly treated his general retrospect mainly from the naval point of view, choosing his illustrations from events connected with his own service. He gave illustrations to show that anything like a scientific medical service in the Navy dates only from the latter half of the nineteenth century, in proof of which he adduced the following humorous instances:—In 1798 the newly-appointed surgeon to the *Serapis*, arriving on board his ship on the East Indies Station, was met by the commanding officer, who said that "he was a surgeon himself and allowed no other surgeon on board his ship." In 1810 the surgeon of the *Violet* wrote to ask for his discharge on the ground that "otherwise death would put an end to his troubles." In 1829 the surgeon of the *Alban* deplored the fact that "having no assistance in the sick berth he had to make his

own poultices in the galley"; while the surgeon to the *Monarch* reported that during an epidemic of typhus his Admiral, "being prejudiced in favour of James's Powder, had it administered to all cases, with the result of four or five deaths per diem." The medicine of the past always seems funny to the medicine of the present. The existence of a section of the Royal Society of Medicine, where medical officers of the Services can exchange experiences with their brethren and civilian colleagues, may deprive the historian 100 years hence of good stories, but it will form one more link in the chain of progressive science.

Annotations.

"Ne quid nimis."

THE FUTURE OF THE BIOCHEMIST IN MEDICINE.

IT is of some interest to notice in the gradual progress of medical science during the past 80 or 100 years how the clinician, the morbid anatomist, the experimental pathologist, and the bacteriologist have in turn dominated medical research. To-day the biochemist holds the field, and it is noteworthy that the impetus to this form of biological investigation and its practical application have come very largely through the bacteriologist and his interest in serological problems. The pages of THE LANCET this week show how prominent this aspect of disease has become, since we publish no less than four papers in which such investigations play a prominent part. The field of research opened to the biochemist in medicine is an enormous one, and it is to be hoped that this may attract men with a deep knowledge of pure organic chemistry to the study of medicine. The need for the expert biochemist in medical schools and in pathological and clinical laboratories is a very real one, and it is doubtful whether the supply is equal to the demand. That biochemistry must be destined to play an important rôle in the investigation of many of the problems of disease is obvious, and more than occasionally, both in diagnosis and treatment, the indications of biochemistry will become the deciding guide. The various agglutination reactions, the developments of vaccine therapy, and the newer forms of chemo-therapy, are all probably but the beginnings of great advances, and these the biochemist, working in conjunction with the bacteriologist, the pharmacologist, and the physician, will certainly help to advance and probably to simplify. It is striking how, in the march of science, the abstruse and apparently transcendental of one period may develop into the commonplace of a later one. Biochemistry is so fascinating and so apparently limitless in its possibilities that we may expect it to attract an increasing number of students. But profound study of chemistry and its application to medicine will not be a remunerative career unless this highly skilled and important branch of medical research and teaching is paid on a scale more commensurate with its importance and its difficulty.

LUNACY AS A STORY THEME.

ONE of the greatest difficulties in dealing with the insane arises from the ignorance which exists throughout the community as to the conditions under which such cases are cared for. This ignorance allows of the growth of foolish prejudices which are fostered and exploited by writers who, probably with no more recondite motive than the provision of amusement for their readers, perpetuate traditions which are responsible for most of the suspicion with which mental hospitals are regarded by the general public. Half a page of a recent number of the *Sphere* is devoted to a short story entitled "Lunacy," in which the transfer of a patient from one institution to another is described. The story does not, apparently, pretend to accuracy, though even if it had been a simple statement of fact it would have been misleading in its implications. In this instance the picture drawn is not even true to nature, and its tendencies are entirely mischievous. The lunatic comes under notice while en route from "a comfortable and exclusive private home" to "a large public asylum." He is in the charge of a "coarse, florid, bloated" man who, at his request, accompanies him into an hotel and there promptly gets drunk. At this stage the "asylum car" appears on the scene and the lunatic helps the attendant into it and goes with him to the asylum gate, where another attendant accepts the drunken man as the patient, hustles him within, and shuts out the lunatic, who vanishes "pathetically into the night." This yarn may be productive of a certain hilarity among those who know anything of lunacy practice in this country, but absurdities of this kind are accepted with avidity by some minds as accurate descriptions of the way in which the insane are treated. As a result, on the one hand foolish fears are entertained, and on the other a class of men—asylum attendants—who, as a rule, are as sober and trustworthy as any other workers, is gravely discredited.

FLORENCE NIGHTINGALE MEDAL.

AT an international conference of Red Cross Societies held at Washington in 1912 it was decided to establish a medal both as a memorial to Miss Florence Nightingale and to give international recognition to outstanding work by trained nurses in all parts of the world. The medal, which will be issued early next year by the International Red Cross Committee at Geneva, is in silver and enamel, consisting of a portrait of Florence Nightingale, "The Lady with the Lamp," with the words "Ad memoriam, Florence Nightingale, 1820–1910." On the reverse, surrounding a space reserved for the name of the recipient, is the inscription: "Pro vera misericordia et cara humanitate perennis decor universalis." The medal is attached to a white and red ribbon on which is displayed a laurel wreath in green enamel surrounding a red cross on a white ground. The distribution of the medal is confined to fully trained nurses, who must hold a full nursing certificate from a recognised training school—a "training school" being a hospital possessing at least 100 beds, and presided over by a resident medical officer. A committee was appointed by the International Red Cross Committee in Geneva to make the necessary arrangements. It was originally decided that not more than six of these medals should be distributed, either annually or in alternate years, to the six most deserving trained nurses, to be selected by the international committee from recommendations submitted by the various national Red Cross Societies, accompanied by particulars showing the grounds on which each recommendation is made. Owing to the outbreak of the war in 1914 the first awards of this medal were postponed, and the International Committee

have now informed the British Red Cross Society that it is intended to award 50 of these medals in January, 1920, and has requested the society to submit their recommendations before the end of the year 1919. To enable the society to comply with this request it is necessary to ask that the names of trained nurses who have, especially during the war, proved themselves to be exceptionally deserving of recognition may be brought to the notice of the British Red Cross Society. Full particulars of the services on which the recommendations are made, and the names of the officials who can personally vouch for the accuracy of the information given, should be forwarded as early as possible, and in no case later than Nov. 30th, for consideration and selection. Recommendations should be sent (marked on the outside "Nightingale Medal") to the Secretary, British Red Cross Society, 83, Pall Mall, London, S.W. 1.

THE INVESTIGATION OF ATMOSPHERIC POLLUTION.

THE real service in the interests of the public health and of economy which the Advisory Committee on Atmospheric Pollution are doing under the ægis of the Meteorological Office is well brought out in their Fifth Annual Report, which we publish this week as a supplement. The period covered is the year commencing April, 1918. We share the hope of the Committee that the keeping unsullied of the air we have to breathe will be regarded by the Ministry of Health as in their province of duties, and it is obvious that to measure the purity of the air the data which this Committee have brought together will be of the utmost value. Apart from the routine work of analysis, which the investigation involves at some 25 stations throughout England and Scotland, important research work supplementary to the observations is being carried out at headquarters.

The present report, like the previous one, bears evidence of this. Fresh branches of inquiry are being thrown out by the Chemical Subcommittee, of which the director of THE LANCET laboratories is a member. A scheme has been drawn up for scientific research in directions which considerably extend the scope of the investigation of atmospheric pollution. Steps have been taken, for instance, to evolve a workable method for the measurement of the acidity of the air, bearing in mind the importance of differentiating between the acidity due to free gas and that attached to suspended particles. It appears that there may be occasions when the air gives alkaline indications, and we can well believe this when we remember that ammonia with other bases is a product of incomplete coal combustion. Ammonium salts—the chloride, for example, which so often occurs as a fume in the chemical laboratory—prove to be more destructive of metallic fittings than free acids; and it is conceivable that ammonium sulphate is more active in degrading building fabrics than sulphur dioxide, for the reason that a double decomposition is then at play which proceeds more readily than an attack by an acid group without a base. Interesting again is the attempt to establish a relation between bacterial and smoke contents of the air, while the pollution by motor traffic, which is rapidly succeeding that of horse traffic, claims attention. Further investigation is to be directed to the microscopical examination of the impurities suspended in the air, with a view to measuring the size of the particles and the distance from their source to which different-sized particles are carried. Another interesting line of research is promised in determining the selective action of rain or snow in bringing down certain constituents of suspended impurity in preference to others. The estimation of the obscuration of light by suspended impurity, which also is in contemplation, should afford instructive results in showing the loss to the community of the sun's health-giving radiations.

The monthly observations at the stations during the year April, 1918—March, 1919, recorded consecutively in our columns, show with all necessary detail the interesting fluctuations, seasonal and topographical, which occur both in the kind and the amount of impurities in the rain and brought down by it. A comparison in respect of deposit of the figures for the two years 1917–18 and 1918–19 shows a diminution in the summer and an increase in the winter during the second period. The rationing of fuel has most probably influenced the results in some directions. There is, for instance, a considerable diminution in the tarry constituents of the deposit which, likely enough, is due to improvements in combustion, the increased use of smokeless fuels—such as gas, coke, and anthracite—and to an economised fuel consumption, especially in domestic fires, which pour out tar into the air. Similarly, the contamination by sulphur products is reduced, which would naturally follow a lower consumption of coal. The enforced economy of coal, in fact, may be expected to effect a corresponding fall in the gaseous and suspended impurities in the air derived from its combustion, perfect or imperfect. This relationship will probably be developed later, as the returns, so far, do not cover a full year of the coal rationing order, which came into being on Oct. 1st, 1918. The war has, of course, reduced the full complement of returns, owing chiefly to a depleted staff of analytical authorities, but there is good prospect of getting the laboratory into full work, and again the Committee confidently expect that further observing stations will shortly be set up. These developments are very satisfactory to the hygienist, for the work of the Committee must have a close bearing on the health and well-being of the community. The purity of the air we breathe shares in importance the purity of the food we eat and that of the water we drink, and, despite the negligible worth of self-praise, we are glad to remind our readers of our association with the movement from its start.

GONORRHŒAL OTITIS IN INFANTS.

LITTLE attention has hitherto been paid to the occurrence of gonococci in the purulent discharge of suppurative otitis media in early infancy. In a review on the bacteriology of acute otitis media Kümmel mentions only two cases, published by Krönig and Deutschmann respectively. Reinhard has also recorded a case in an infant aged 14 days. In all these cases the children had developed the otitis during or shortly after a typical ophthalmia neonatorum. Putzig,[1] from whose paper the foregoing information is obtained, has recently reported a case in which the otitis developed almost two months after the cure of the ophthalmia, so that it can hardly be supposed that the gonococci, as in the other cases on

[1] Deutsche Medizinische Wochenschrift, 1919, 1165.

record, had passed through the nasal duct into the throat and so into the ear. It was more probable that the otitis was due to the mother, who still had a specific discharge. As the otorrhœa proved to be very obstinate, the possibility of gonococcal infection suggested itself, and on bacteriological examination typical gonococci were found in the ear discharge. Treatment with 1 per cent. protargol was instituted and rapid recovery took place. The case illustrates the necessity of making a bacteriological examination in all cases of obstinate otorrhœa in infants, especially in those who have previously suffered from ophthalmia; for, where indicated, specific treatment with protargol followed by potassium permanganate leads to cure in a few days.

A PATHOLOGICAL RESEARCH FELLOWSHIP.

AT a time when hospital finance is becoming more and more difficult it is pleasing to note that the value of organised clinical research is recognised by a few generous souls. St. Bartholomew's Hospital Medical School has become the recipient of a sum of money sufficient to endow a research into "the Pathology and Treatment of Lymphadenoma." This is due to the munificence of Mrs. L. B. Rose, of Bedford, who has so arranged that sufficient funds are available for the research to be carried on for a period of ten years if necessary. Working expenses are also provided for, and the sum given is sufficient to support a second researcher if the board of electors to the fellowship deem it desirable. The gift should have attraction for workers from all parts of the country, for it has been decided by the hospital authorities to throw open the Rose Research Fellowship for competition by any who may desire to apply. Lymphadenoma is still a disease of which little is known, either on the pathological or therapeutic side. The available material is scanty, and although it is expected that the research will for the most part be carried on at St. Bartholomew's Hospital, powers are given to the electors from time to time to permit a part of it being performed elsewhere. It will be seen that the fellowship is generously conceived, and its holder will be a fortunate person.

NORMAL LABOUR ON THE CINEMA.

Dr. Drummond Robinson has spent time, trouble, and money on the obstetrical films recently shown at the Royal Society of Medicine, but we do not share the apologetic attitude adopted by those members of the society who criticised them in detail. The principle of teaching by cinematograph, where practicable, has long been accepted, and it is in the details of its application to any subject that an individual film must stand or fall, especially if it is offered for sale to teaching institutions. In Dr. Robinson's films the diagrammatic line drawings in sagittal section were similar to those seen in many text-books. Had they been sufficiently numerous to give an impression of continuous movement when released at a fast pace, they might have been helpful, though drawings of such complicated movements in two dimensions only are always difficult to interpret. The baby moved down in a series of jerks comparable to those made by the minute hands of certain large clocks worked by electricity; no one attitude merged into the next even rapidly enough to cause the disagreeable flicker associated with a slow film. Moreover, doubtless through slight differences in successive drawings of the vertebral column, too much apparent movement of the bony structures took place, including even alternate narrowing and widening of the spinal canal. The use of a stamp for the fixed portions of the vertebral column would have averted this curious illusion and saved time in drawing. Dr. Robinson excused the jerky movements on the score of the enormous expense involved in the drawings, but for experimental and demonstration, if not for selling purposes, it would have proved more effective to concentrate on either vertex or breech and show the same number of drawings spread over one presentation only. The pictures of actual labour on the living subject were also disappointing, though the birth area certainly filled the picture, and the movements of the emerging child were shown as clearly as possible. Since in the vertex case no attempt was made to guard the perineum—doubtless so as not to obscure the view of the child's movements—we may conclude that the object was the demonstration of the physiology as opposed to the management of labour; such movements, however, as are visible to an observer facing the perineum form too small a part of the whole complicated process to be of any help to a student. As to the possible value of these films in teaching the management of labour, the most important duty of the obstetrician in a normal case is to guard the perineum, and the spectacle of an unaided delivery with a torn perineum is of negative educational value. It will not tend to improve the practice of the student, only too prone to regard a tear merely as an opportunity for practice in putting in stitches, if this accident is deliberately allowed to occur in what should be a model film. In any case, the doctrine that a person should be allowed to conduct labour without having watched actual delivery and having received practical instruction in technique at the bedside would surely be indefensible; films of the natural subject could in no way replace such instruction. The omission of the customary warm flannel round the buttocks of the breech baby, and the demonstration of pictures of a case insufficiently prepared, seem to show that the preparation of a really satisfactory obstetric film is very difficult. Dr. Robinson should have discarded all unsatisfactory films and have delayed release until he could show a model one, if he wished to convince his audience that his subject is suitable for cinematograph teaching. Such films might be useful in the future for training midwives in this country or in India, especially if less prominence were given to the actual delivery in comparison with the preparations therefor. They should comprise pictures of antenatal clinics, the taking of measurements, and testing of urines; hygienic under-garments for pregnant women should be shown, and pictures of the fittings of a lying-in hospital. Midwives and students should be seen washing up, putting on sterile gowns and gloves, others making and arranging the bed, and movable tables with accessories should be demonstrated; other pictures might show the adaptation of a small cottage to the purpose of a lying-in room. Certain details in Dr. Robinson's film, such as the cleaning of the baby's eyes, the jaw and shoulder traction method of extracting a breech baby, and subsequent resuscitation from asphyxia, were excellently shown. Had the pictures been offered only as a demonstration of possibilities, and criticism invited, we should have congratulated all concerned on the enterprise, and trusted that

with the coöperation of fellow obstetricians Dr. Robinson would be able in the future to turn out some really first-rate films. It is only because they are offered for sale to teaching institutions as a more or less finished article that we feel bound to say that the attempt to demonstrate both the physiology and the management of labour in the same films was not a real success.

NEW INSTITUTE FOR PARASITOLOGICAL RESEARCH AT CAMBRIDGE.

THE Senate of Cambridge University have recently accepted with gratitude a generous benefaction from Mr. and Mrs. P. A. Molteno. Mr. Molteno is a member of a family well known in the Cape Colony for its interest in, and support of, the advances of science, and he is himself a member of Trinity College. Mr. and Mrs. Molteno have presented the sum of £20,000 for the erection and £10,000 for the maintenance of an institute for research on parasitology, under the initial direction of Professor George H. T. Nuttall, F.R.S. Tentative plans for the building have been submitted to, and approved by, the donors, who express the hope that it will be found possible to carry them out in their present form. In the letter making the offer Mr. Molteno refers in flattering terms to the work already done in parasitology by Professor Nuttall while working under the most disadvantageous conditions, and to the enormous value of the results already achieved in the prevention and control of diseases transmitted by parasites. He regards further research in this direction as indispensable if Africa is to be made habitable for white men and for animals of European stock, and it will also help to protect human and animal life from disease throughout the world. The gift is a specially happy one at a time when the need for national economy threatens to limit the allotment of Government grants for the purpose of research.

ADDITIONS TO THE WELLCOME HISTORICAL MEDICAL MUSEUM.

THE historical medical museum in Wigmore-street, initiated by Mr. Henry S. Wellcome, has now become a well-known and permanent institution. Almost everything bearing on the history of medicine is represented, and great credit is due to the curator, Mr. C. J. S. Thompson, for the judgment displayed in the selection of articles showing the evolution and development of medicine and surgery, and in their arrangement. The museum is valuable and instructive from the artistic as well as the historical standpoint. Within the past few months important accessions have been made to the collection. Carved figures known as kareaus or spirit scarers from the Nicobar Islands, in the Bay of Bengal, are represented by some excellent specimens. An extensive collection of medical folk-lore charms found in London has been added, many of the specimens being Jewish charms. Here we noted several bead necklaces for warding off colds and bronchitis, and unexpectedly reproducing the pathology of some modern quackery. A cast of the statue of Æsculapius, from the Hope collection at Deepdene, generally known as the Hope Æsculapius, is now in the Wellcome Museum. It is of heroic size, 6 feet 4 inches in height, and represents the tutelary deity of physicians in an erect posture, cloaked, leaning on a long staff around which a serpent is coiled. Against the left foot is what Michaelis terms the casket, but which looks more like a diptychon. The folds on the left arm are particularly worthy of praise, in the opinion of sculptors. The statue was taken from Hadrian's villa, near Tivoli. A small-sized marble Æsculapius excavated at Carthage has also been acquired, as well as a Roman dancing-girl in bronze. The interesting feature of this statuette is that she wears what presumably from its shape and general appearance is an abdominal girdle or belt. A terra-cotta statuette of a blind man comes from Cyprus, 300 A.D.—the interest of this figure is mainly in the reading tablet with incised letters upon which the hands are placed, for no doubt the blind man is reading by the sense of touch. Any collector of pretty things, medical man or no, will be charmed with an especially beautiful Jacobean medicine chest. This chest is most ingeniously contrived to economise space, and the cabinet work affords convincing evidence that in those days, *circa* 1690, work was not scamped. One of the finds of the museum is the first official pharmacopœia—Nuovo Receptario Composito, date 1498, compiled by the physicians of the College of Medicine of Florence. The collection of clinical thermometers made by Sir Hermann Weber has been presented to the museum by his son, Dr. F. Parkes Weber. The collection is complete from the time that the clinical thermometer was first introduced into Great Britain up to the present day. The late Sir Lauder Brunton, in a Presidential address to the Medical Society of London, narrated that when he was a medical student at Edinburgh the use of the clinical thermometer had just been familiarised in the country by Sir William Aitken, later the well-known professor of pathology at Netley. Sir Lauder Brunton describes amusingly[1] his passage as a clerk through the clinical wards armed with two of these thermometers. One was bent and the other was straight, both were between 1 foot and 18 inches long. They were contained in what resembled a modern gun-case, and each observation required about ten minutes. A striking oil-painting of William Harvey is a copy of the painting by C. Janssen in the board room of Canterbury Hospital; we noticed also a portrait of Dr. Lettsom and family by I. Zoffany; the Culpeper microscope, complete in every detail; a Saint Cosmo and Saint Damian reliquary, being a cup carved from agate, used for taking medicinal drafts—physicians lent such cups to their patients. A bed-table of seventeenth century, with all modern improvements; a portable bath-tub for a lady of the time of Louis XIV., made of wood with a removable metal casing; and an Italian medicine chest of exquisite workmanship, show how old much of our modernity is. It will be seen that the recent additions to the Wellcome Historical Museum maintain the character of the institution as educative as well as artistic.

THE statute to make Greek an optional subject at Responsions was reintroduced on Tuesday last at a meeting of Congregation of Oxford University. The preamble was approved.

THE next session of the General Council of Medical Education and Registration will commence at 2 P.M. on Tuesday, Nov. 25th, when Sir Donald MacAlister will take the chair and give the presidential address.

[1] THE LANCET, Oct. 14th, 1905, p. 1087.

INDUSTRIAL MEDICINE IN THE UNITED STATES.[1]

THE July and August numbers of this new journal, the first two numbers of which we reviewed in September (p. 587), contain articles dealing with both the preventive and curative sides of industrial medicine. The writers in every case are Americans, and the absence so far of any contributions from British authors might lead us to think we were, in this country, not abreast of the times, did not Dr. G. M. Price's article on factory inspection in the States lift the veil from a standard of work to which we have never fallen on this side of the water. Factory inspection with us has always been a highly specialised profession, carried on by whole-time experts of recognised social status and possessed of scientific knowledge, whose skilled work is fully reported upon annually. In the States, "with every political upheaval and with a change in administration there is a change in the head, chief, or commissioner of the department." And Dr. Price writes:—

"In Pennsylvania I found that many of the factory inspectors were conducting private business enterprises while holding commissions in the department. One is alleged to have sold fire insurance; another kept a saloon; still another was in the coal business. In another state, where the chief factory inspector divides his time between conducting a livery stable he owns and the business of caring for some 30,000 factory wage-earners, I found him contributing a remarkably concise annual report consisting of exactly 14 words. It reads, under date of July 1st, 1911, as follows: 'I have visited the same factories as last year and find conditions the same.'"

Reading this article we have no need to blush for our country.

Nursing in Industry.

In Mary Beard's story of nursing in industry we read of a recent and rapid introduction of nurses into American factories not unlike what is taking place in this country; the enterprise of individual employers seems in this matter to be far ahead of official requirements. The author tells of the work done and of the influence exerted by the nurses, and puts in a plea for coördination of all classes of public health nursing, a move which with us must receive an impetus from the training of health visitors just set on foot by the Ministry of Health, though unfortunately the Ministry has omitted from the training any reference to industrial work. This class of nurse is rapidly increasing with us, and the moment was opportune to have recommended that some part of our course should be devoted to the specialised work of industrial requirements. An article on mortality in unhealthy trades, from the pen of A. D. Reiley, is actuarial in scope and too short to compass in any adequate manner the subject with which it deals. Some of the difficulties, of which labour turn-over is an important one, standing in the way of any correct estimate of the actual ravages of industrial disease, are, however, pointed out.

Dust Inhalation and Tuberculosis.

The most important paper in these two numbers is one by Dr. H. R. M. Landis on the manifestations of dust inhalation. After an historical introduction, the author proceeds to deal with his subject, grouping it according to the organic or inorganic origin of the dusts inhaled. We wish he had chosen similarity of clinical or pathological manifestations instead, and had left the origins of the dusts to arrange themselves accordingly; this grouping is the natural one from a medical point of view, and, as Dr. E. L. Collis has shown in his Milroy lectures (with which, by the way, Dr. Landis does not appear to be familiar), the dusts then group themselves simply. At times the writer advances views which hardly tally with known facts; thus he writes:—

"My own belief is that the higher incidence of tuberculosis among those exposed to inorganic dust is due to the fact that dust acts as a convenient carrier of tubercle bacilli. In other words, it is not the preliminary injury which the dust is responsible for that predisposes the individual to tuberculosis, but the readiness with which tubercle bacilli may be carried into the respiratory tract by a dust-laden atmosphere."

This theory does not account (to give only one instance out of many possible ones) for the tuberculous death-rate of granite dressers—who are greatly exposed to dust, working, as many of them do, in closed sheds and using pneumatic tools—being lower than that of sandstone masons—who, working with hammer and chisels in open lean-to sheds, are less exposed to dust; but sandstone is nearly pure silica, while granite only contains 30 per cent. Tuberculosis implanted on silicosis has clinical manifestations and an underlying pathology which clearly distinguishes it from tuberculosis (possibly dust-borne in origin) not associated with silicotic fibrosis. We are surprised to find a clinician of Dr. Landis's standing not accentuating more clearly these two clinical types of pulmonary tuberculosis, especially when referring to the occurrence of phthisis among textile operatives, tobacco factory-workers, and garment-makers. We regret, also, to find the statement made that: "The sharper and more angular the dust particles, the greater will be the amount of mechanical injury, and hence the greater the inflammatory reaction." Assuredly minute particles, mostly below 1μ in diameter, moving slowly in the moist interior of an alveolus, can have no power to cause mechanical injury; were the matter in doubt the comparative absence of fibrosis in those exposed to the inhalation of fine emery and glass dusts, hard, angular, and spicular as they are, would lay it at rest. Silica dust is dangerous, not on account of its hardness and shape, but of its chemical composition. The gross and minute anatomy of silicosis is well described; indeed, Dr. Landis seems to confine himself to describing this form of pneumonoconiosis when discussing the pathology, symptoms, and physical signs due to inhaling inorganic dust, and not to recognise the existence of other pneumonoconioses due to the inhalation of other inorganic dusts than silica. The diagnostic value of radiology is stated; but the author is silent over the disturbing influence, which inhalation of dust of heavy materials, such as iron, lead, or gold, all opaque to X rays, may have upon the inferences to be drawn from the shadows disclosed. A review, contributed by Dr. H. F. Smyth, on methods of determining the dust-content of air, is well placed next to the above-noted article. This review is an excellent survey of present knowledge on the subject, and brings together information not previously collated. Dr. Smyth expresses a preference for Palmer's method of drawing dust-laden air through a fine water-spray, though he also commends Muir and Johnson's sugar-filter method, and Duckering's cotton-wool filter. All interested in the subject of dust estimation will thank the author for this careful paper.

Industrial Surgery.

Three articles are devoted to surgical questions. One, by Dr. R. B. Osgood, is on the use of radiography in disclosing otherwise unsuspected bone lesions in the lumbar, sacral, and iliac regions in cases of so-called "back strains." Such cases in industry have a medico-legal aspect, but Dr. Osgood points out that knowledge to-day on the bony variations which exist within the normal is too jejune for radiography to afford, even in expert hands, an answer in every case as to whether a definite lesion is present or whether the pain is functional. The article, which is well and clearly illustrated, provokes awkward thoughts as to the correctness in the past of many a lightly-made diagnosis of lumbago and the like. The writer holds that "the diagnosis of hysterical spine should rarely be made; that the diagnosis of railroad spine means nothing; that the diagnosis of functional spine is usually a confession of our ignorance of the true cause of the trouble." Dr. J. J. Moorhead has something to say of how lessons learnt in the war will be of use in industrial surgery. He points out the value of "mechanical sterilisation" or "débridement" when badly crushed tissues have to be treated in preference to chemical sterilisation; the improved treatment which has been learnt of fractures; the importance of early mobilisation for joint injuries; and the advances made in dealing with surgery of the thorax. Dr. C. A. Lauffer discusses hernia in industry, and dwells upon the impossibility of diagnosing the presence of an empty hernial sac. He points out that in a true traumatic hernia "the peritoneum is torn; there is no sac, the viscera come out through a fresh tear in the peritoneum," and that the condition can only be diagnosed from incarceration in a pre-existing sac at operation. He recommends removal of all

[1] Journal of Industrial Hygiene. Nos. 3 and 4, July and August, 1919. New York: The Macmillan Co. Price 3*s*. 6*d*. or 21*s*. annually.

hernial sacs at the expense of the employer as "calculated to restore faithful employees to industry and, at the same time, as a patriotic duty by which industrial workers are restored to their greatest efficiency."

Chronic Manganese Poisoning.

Not the least interesting contribution is one by Dr. D. L. Edsall, Dr. F. P. Wilbur, and Dr. C. D. Drinker on chronic manganese poisoning. The condition, which has not, so far as we know, been described in this country, arises from prolonged inhalation of dust of manganese dioxide, and the cases in America and on the Continent have occurred among men manipulating manganese ores. The symptoms, which all concern the central nervous system, have some semblance to those of multiple sclerosis, but once the occupation is known a differential diagnosis is comparatively easy. The condition is one of such interest that the syndrome given by the authors is worth quoting:—

"1. A history of work in manganese dust for at least three months. 2. Languor and sleepiness. 3. Stolid, mask-like facies. 4. Low monotonous voice; economical speech. 5. Muscular twitching, varying in degree from a fine tremor of the hands to gross rhythmical movements of the arms, legs, trunk, and head. 6. Cramps in the calves and a complaint of stiffness in the muscles of the legs, the cramps usually coming on at night and being worse after a day of exertion. 7. Slight increase in tendon reflexes. 8. Ankle and patellar clonus ..... 9. Retropulsion and propulsion. 10. A peculiar slapping gait ..... 11. Occasionally uncontrollable laughter; less frequently crying. 12. Uniformly absent are any disturbances of deep or superficial sensation, eye changes, rectal, genito-urinary, or gastro-intestinal disturbances, reactions of degeneration, blood, urine, and spinal fluid alterations. It is significant that, unlike lead, manganese produces no life-shortening degenerations. Seriously poisoned men are long-lived cripples. The metal apparently makes a very definite attack upon some non-vital portion of the neuro-muscular system, destroys it thoroughly if time for action is permitted, and leaves the victim quite well in every other respect."

Similarities can be traced between these symptoms and those of arsenic poisoning (as seen in the contaminated beer cases which occurred in England, in Manchester, Salford, and a large area round these towns, nearly 20 years ago),[2] and of chronic lead poisoning; while the portal of entry, the inhalation of dust, is the same as that of industrial lead poisoning. Ores of manganese are handled in this country, and the metal is used in the metallurgical industries. We cannot help thinking that if cases are looked for they will be found; and for this reason we give prominence to our notice of the paper.

Poisons of the Aromatic Series.

The last article, one on poisons of the aromatic series, by Dr. Alice Hamilton, deals with benzene and its nitro- and amido-derivatives. The subject is an important one; but the arrangement of the article is lacking in plan, and we are carried from one compound to another without any grouping by chemical structure or symptomatology. Finally, the article seems like the play of *Hamlet* without the Prince of Denmark when it concludes without reference to poisoning by trinitrotoluene (T.N.T.). The train of symptoms caused by this high explosive were so carefully worked out in wartime that we think adequate consideration of the effects produced by other compounds built on the benzene ring cannot be instituted without comparison with those worked out for T.N.T.

[2] THE LANCET, 1900, ii., 1590.

MEDICAL MAYORS.—Among the names of medical men recently elected to the position of chief magistrate are those of Dr. F. M. Blumer (Stafford), Dr. H. A. Latimer (Tunbridge Wells), Dr. A. J. Rice-Oxley (Kensington), and Dr. P. A. Roden (Droitwich).

THE CIVIL USE OF RED CROSS AMBULANCES.—Of the 296 ambulances allotted by the Red Cross Society and the Order of St. John to county directors for the service of the general public, 171 have already been handed over. Reports show that during three months' service the number of cases carried per ambulance averaged 26. The Ministry of Pensions is availing itself of the provisions afforded by these ambulances, and the Treasury has sanctioned payment for the use of the cars for pension cases on the scale laid down in the scheme of the Home Service Ambulance Committee.

BACILLARY DYSENTERY IN MACEDONIA.

MUCH information, the fruit of real research, is contained in the valuable contribution entitled "Studies of Bacillary Dysentery Occurring in the British Forces in Macedonia," which has now been published, under the editorship of Dr. L. S. Dudgeon, consulting bacteriologist to the British Salonika Force, by the Medical Research Committee. On the elucidation of many of the various problems presented by the difficulties and complexities of endemic and epidemic dysentery in a subtropical region during three years of war the editor of these studies and his fellow contributors are to be warmly congratulated; their labours have been achieved by coördinated team work in various laboratories of the Salonika area, and carried out under conditions which only organisation emanating from a central laboratory could have successfully overcome.

Among the points made the object of research and investigation, certain stand out pre-eminently for their practical bearing and interest. The plea for the closer and more intelligent coördination between the wards and laboratory is one well worthy of emphasis. The want of such makes itself felt as much among our home hospitals during peace as in the field hospitals in time of war. For without this much needed close contact and understanding between clinician and pathologist the value of laboratory effort and research may too often be lost sight of or even ignored.

Effect of Delayed Examination on Bacteriological Results.

Attention is drawn particularly to the importance of specimens of dysenteric stools reaching the laboratory with as little delay as possible; on this the success of bacteriological examination largely depends. The point is made clear by a careful analysis of results obtained in several laboratories in the Salonika command, which shows that the number of positive dysentery findings varied according to the time which had elapsed between the taking of the specimen and its arrival at the laboratory. Another important factor demonstrated is the harmful action of fæcal material on the cultivation of the dysentery group of organisms, as opposed to the successful findings in cases where the stools consisted of pure blood and mucus.

The Chemical Reaction of Dysenteric Stools.

Delayed examination, particularly in the presence of fæcal material, was found to result in a diminution of the normal alkalinity of the stools and, with the increasingly acid reaction, in an inhibition of the growth of dysentery bacilli. The influence of acids and alkalis is explained by experiments which showed the deleterious effect of lactic acid on the viability of *B. Shiga*, *B. Flexner*, *and B. Morgan* (1), and further, that this effect could be overcome and counteracted by the addition of normal caustic soda. Recognition of the importance of the changes in reaction of the stools from alkaline to acid, and the influence of these changes on successful cultivation of dysentery organisms, led to the adoption of measures to preserve the alkalinity of specimens, when, owing to the length of time in transit, circumstances prevented bacteriological examination from being made for several hours. An equal quantity of 3 per cent. of normal sodium hydroxide was added and intimately mixed with each specimen immediately after collection.

Cultural Tests applied to the Dysentery Group.

The result of hæmocultures during the acute stages of bacillary dysentery were recorded in 145 cases, but all proved sterile save in two instances which yielded growth of Flexner-Y bacillus.

The technique followed and various culture media and methods employed in the course of the laboratory examinations made are detailed in the opening section of the report. 140 strains of the Flexner group were submitted to prolonged cultural tests and found to possess characteristics which were classed as primary or constant and secondary or inconstant. Owing to the instability of the secondary characteristics, and confusion in classification resulting from them, the use of lactose, glucose, and mannite only were relied upon for primary differentiation of the Flexner group, and final classification was attempted by means of serological reactions; but the variations of the members of this group in their response to serological tests rendered

ultimate definition impossible. Selected strains agglutinated with their autogenous antisera, but, when cross agglutinated, divergent reactions occurred, and similarly wide differences in agglutinability were experienced when these strains were tested against the antisera prepared at the R.A.M. College and Lister Institute. Certain strains proved entirely inagglutinable except with their autogenous antisera. Mention is made of the isolation of inagglutinable strains of Flexner bacilli from typical blood and mucus stools in a number of cases and of their occurring in almost pure culture in some instances. Little doubt is attached to these strains being capable of causing acute dysentery, and it is reasonable to agree with the suggestion that they "may be aberrant forms of the true mannite-fermenting group of dysentery bacilli." Absorption tests confirmed the divergence shown by the agglutination reactions.

As the result of investigation into the properties of the Flexner organisms the subdivision of the group by cultural examination is deprecated, but the future development of serological tests promises eventually an accurate classification of the group. (Such promise is in some measure fulfilled by the recommendations of the Special War Office Committee on Dysentery and the subdivision of the Flexner group into five types, designated V, W, X, Y, and Z.) The correct classification of the inagglutinable type and its relationship with the true organisms call for close observation of the cultural, serological, and toxic properties.

The Shiga Group.

In dealing with the characters of the true Shiga bacillus the report finds no occasion for special comment, but devotes considerable attention to the so-called *para-Shiga bacillus* isolated from a certain number of typical blood and mucus stools. Though occasionally forming indol, this variant otherwise resembles the Shiga bacillus culturally, but serologically was found to be distinct from it in both agglutination and absorption tests. This organism was described originally by Schmitz, and subsequently designated *B. ambiguus* by Andrewes. A subdivision of the para group is made into para-Shiga + and para-Shiga −, according to the power of forming indol or not. That the prefix para is an unsatisfactory one is fully recognised in the report, but in view of the striking differentiation provided by agglutination and absorption tests between the true Shiga bacillus, para + and para − organisms, it is claimed that these prefixes are justified until a more suitable title is forthcoming.

B. Morgan.

The account of the behaviour of the Morgan group, though limited to 14 strains of Morgan's bacillus No. 1, is welcome in view of the free occurrence of the bacillus in cultivation from blood and mucus stools during certain periods of the dysentery seasons in Macedonia. Its frequency, indeed, was so striking that the failure to assign it a place among the recognised dysenteric organisms, and to attach a definite reason for its incidence, is disappointing. The strains investigated all yielded acid and gas in small quantity in glucose, but caused no change in lactose, saccharose, dulcitol, and mannite; were Gram-negative, and motile in varying degree. In 11 of the 14 strains hæmolytic properties were observed in the special tests applied.

Two of the strains were inoculated into rabbits and produced immunisation. The resulting antisera were tested against all the members of this group, but agglutination was only forthcoming in the case of the antiserum and autogenous bacillus. Though numerous other strains of *B. Morgan* (1) were tested with these two antisera, all yielded negative results, and it was evident that for serological tests of Morgan bacillus these antisera were useless. The results of absorption tests coincided exactly with those of the agglutination experiments, absorption only occurring when antigen and autogenous antiserum were employed. The formalin death points of these organisms were noted, and in contrast with the true Shiga bacillus, which is killed by 0·1 per cent. formalin, the para-Shiga group was found to be less vulnerable; but the Morgan bacillus No. 1 was still more resistant, requiring a strength of 0·14 per cent. before being killed.

The Acid Agglutination Test.

This test, consisting of the addition of varying amounts of normal sodium hydrate and acetic acid to emulsions of bacilli, recommended by Michaelis as a ready method of differentiating the dysentery group from other organisms by its constant failure to agglutinate, was fully investigated with Shiga, Flexner, and para-Shiga bacilli. The observer's results confirmed those of Captain E. G. D. Murray, R.A.M.C., to which they refer, that Michaelis's acid agglutination reaction cannot be relied upon for the identification of dysentery bacilli.

Arthritis as a Complication of Dysentery.

Arthritis involving one or more of the large joints was met with in 25 cases, in ten of which the joint fluid was examined bacteriologically. In only one case the Shiga bacillus was isolated, and in the others the fluid, which contained abundant pus cells, proved sterile, although the Shiga bacillus was the cause of the intestinal infection in seven of the ten, and although the complication occurred during the acute stage of the disease in every case. Agglutination tests were carried out with the joint fluids against antigens of *B. Shiga, B. Flexner, and B. "Y."* In one case the fluid yielded positive agglutination with Shiga up to 1/150 dilution, and in another with Flexner up to 1/300, and in a proved case of Shiga dysentery the joint fluid yielded a high Shiga agglutinin content. Injection of the joint exudates into joint cavities and peritoneum of rabbits produced no ill-effects and failed to excite dysentery agglutinins in the serum of the inoculated rabbits.

Dysentery Agglutinins in Human Sera.

Observations on the effect of storage at laboratory temperature over a period of seven days showed that in the majority of instances the sera were not affected, whether in contact with the blood clot or free from red cells. The influence of heat at 55° C. produced a reduction of the agglutinin content of dysenteric sera. This action was usually complete in 15 to 30 minutes and affected the titres of different antigens in a similar manner.

An important comparison of agglutination records made at 37° C. and 55° C. emphasises that immersion of the agglutination tubes in water at 55° C. is more advantageous than warm air at 37° C., and that the incubation period of five hours is better than three hours. The most satisfactory results in determining agglutination reactions are therefore obtained by partial immersion of the tubes in water at 55° C. with a time-limit of five hours, readings being taken after half an hour at room temperature. A series of investigations were carried out with the object of ascertaining the agglutinin content of the blood in cases of acute bacillary dysentery and at what period of the disease the agglutinins occur. Care was taken not to lose sight of the possible influence of previous mild attacks of diarrhœa, from which, indeed, after several months' residence in Macedonia, but few were totally exempt; the consequent likelihood of pre-existing agglutinins in cases later suffering from the acute form of the disease was noted.

Shiga Infection.

Out of a total of 177 patients from whom *B. Shiga* was cultivated during the acute stages of infection the sera of no fewer than 77 failed to react with Shiga antigen in a dilution of 1 in 25. The sera from the 177 cases of acute Shiga dysentery were also tested for Flexner agglutinins, with the striking result that 112 reacted with a Flexner antigen, known as the Gallipoli strain, in dilutions above 1 in 100; but with two other Flexner strains no reaction occurred except in low dilutions. These results, as pointed out, do not conform with the so-called "Martini Lentz" law—that patients infected with the Flexner bacillus develop Flexner but not Shiga agglutinins, the converse being also believed to hold good—and afford proof that the law is based on insufficient data. That the majority of Shiga cases were doubly infected by Shiga and Flexner bacilli cannot be entertained in explanation of the presence of Flexner agglutinins, for the Flexner organism was consistently absent by cultural tests.

The conclusions drawn from the observations made are that a reaction with dilution 1 in 25 is strongly suggestive, and one with 1 in 40 is positive indication of a Shiga infection, also that Shiga cases may show a high Flexner agglutinin content, and that cases of para-Shiga dysentery do not give a Shiga agglutinin reaction.

Flexner Infections.

The results of agglutinin reactions obtained in cases of acute Flexner dysentery provide a striking contrast when compared with those in Shiga dysentery. For it was found

that out of 211 Flexner cases only 3 agglutinated a Shiga antigen in dilutions of 1 in 25. In 104 of these 211 cases a reaction was obtained with the Flexner Gallipoli antigen in dilutions of over 1 in 100, but with other Flexner strains 45 of these sera did not react, 31 reacted in dilutions of 1 in 25 and 1 in 50, and 28 between 1 in 50 and 1 in 100. Hence, if the agglutination test is to be utilised as a laboratory method for diagnosing Flexner dysentery, the importance of employing a sensitive Flexner antigen must be emphasised. In the event of cultural tests not being possible or failing to show the presence of a member of the dysenteric group in cases diagnosed clinically as dysentery, it is urged that application of the agglutination test to a patient's serum may provide valuable and reliable evidence of Shiga infection. But, on account of the high Flexner agglutinin content which may occur with a Shiga infection, the same value cannot be attached to the test when applied to cases of Flexner dysentery. In these cases a positive diagnosis must be guided by a reaction with not less than 1 in 150 dilution and by the absence of a Shiga reaction, the tests being preferably made with multiple antigens and repeated at a week's interval. By repetition of the test at intervals of a week it was observed that a rising or falling Shiga reaction could be taken as evidence of Shiga infection, but much less diagnostic importance is to be attached to a similar change in Flexner reactions.

Duration of Agglutinating Properties in the Blood of Dysentery Cases.

An estimate as to the duration of the presence of agglutinins in the blood, after convalescence is established, presents a problem beset with complications, owing to the possibility of recurrence of attacks of dysentery and diarrhœa, which may be due to a lighting up of the original infection, a re-infection with the same organism, or a fresh infection by another member of the dysenteric group. Where, however, a recurrence has not occurred, it is judged that those patients who are found to have a low agglutinin content for Shiga or Flexner rapidly lose this during convalescence. Out of a total of 325 "convalescent" cases investigated, 87 only gave evidence of infection, 19 yielding positive and 17 probable Shiga, and 53 positive Flexner reactions. Of the 34 Shiga cases, 24 were found to have an associated Flexner reaction with a minimum dilution of 1 in 150.

Opposition to the suggestion that these concomitant Flexner reactions are the result of concurrent infections by the Flexner bacillus is based on the following grounds: (1) The frequency with which associated Flexner reactions are found in Shiga cases is out of all proportion to bacteriological evidence; (2) the absence of Shiga agglutinins in proved Flexner cases; (3) absorption tests which were applied in the Shiga bacilli to Shiga sera, known to possess Flexner agglutinins, remove both the Shiga and the bulk of the Flexner agglutinins. Whereas confidence is expressed as to the diagnostic values of the Shiga reaction, with Flexner reactions, on the other hand, no attempt is made to disguise the difficulties presented in forming an opinion without a complete inquiry into the cases, for the very reason that a transient unreported diarrhœa may be due to the Flexner bacillus. Moreover, even in the absence of any history of diarrhœa or dysentery, Flexner reactions, of 1 in 150 dilution and higher, have been found; these are evidence possibly of mild infection without symptoms of any intestinal lesion, analogous, as is pointed out, to the finding of malarial parasites or cysts of *E. histolytica* where there is no history indicating either malarial fever or amœbic dysentery.

The suggested standard for human serum of evidence of Flexner infection—viz., a reaction with not less than 1 in 150 dilution—is recognised as an arbitrary one, but emphasis is laid on the importance of ascertaining at the same time whether Shiga agglutinins are present or not before passing a verdict in favour of the Flexner bacillus as the real cause.

Importance of Absorption Tests.

The application of absorption tests to sera from cases of bacillary dysentery by saturation with standard cultures of *B. Shiga* and two strains from *B. Flexner* is regarded of the greatest value in providing information as to the responsible organisms in cases where the bacteriological results and serological reactions do not agree. In all Shiga cases there was found to be complete absorption of the specific agglutinin; in some Shiga cases saturation with the two Flexner strains caused a partial reduction of the Shiga agglutinins, in others the Shiga agglutinin value was unaffected by the Flexner strains.

In Flexner cases it was discovered that, though saturation in the Shiga bacilli might reduce the titre of a Flexner serum, the agglutinin contents of the sera were completely reduced by the Gallipoli Flexner strain, and distinctly but partially so by the other Flexner-"Y" cultures.

Animal Inoculation.

A certain number of animal experiments were carried out to ascertain the effect of intravenous inoculation of mixed dysentery vaccines on the agglutinin content of rabbits' sera. For this purpose one vaccine containing four Flexner strains, another, including four Flexner strains and *B. Shiga*, were used for the immunisation of the rabbits. The sera obtained from the immunised animals were submitted to agglutination and absorption tests, and the varying degrees of response at different intervals are recorded in detail.

Convalescent and "Carrier" Cases.

An interesting review and careful analysis is made of convalescent cases of dysentery transferred to a convalescent camp, particularly with reference to the liability to recurrence. Examination showed that a large number of such cases had defective teeth, which were regarded as likely to retard the course of convalescence and to give rise to subsequent gastric and intestinal derangement unless remedied. During a period of 15 months 195 relapses occurred among a total of over 8000 cases which had passed through the convalescent camps.

The histories of 194 selected cases revealed that 145 had suffered from three or more attacks of dysentery, and, as all still passed mucus, they were regarded as chronic dysentery. The importance of the presence of mucus in the stools of patients with a previous history of dysentery, is specially emphasised as a sign of continued infectivity. Carriers among convalescent dysentery patients were estimated to number about 6 per cent., reduced three months after onset to 1·5 per cent. It is urged that the risk of carriers being discharged from hospital would be considerably reduced if the significance of the presence of mucus in the stools were better appreciated.

In dealing with carrier or relapsing cases a combination of bacteriological investigations and microscopical examination of the stools is regarded as essential, particularly in view of the possible coincidence of infection by Flexner or Shiga organisms, with free amœbæ or cysts of *E. histolytica*.

Serum Therapy.

The justice of the criticism expressed that the treatment of bacillary dysentery by serum therapy is not "thoroughly satisfactory" cannot be denied. The experience which lends ground to such criticism is directed particularly to the necessity demanded for the use of the large and repeated doses of serum, and to the undoubted fact that antidysenteric sera compare unfavourably in therapeutic value with antidiphtheritic serum—"quite apart from the differences in pathology of the two diseases"—"because the methods in vogue for the preparation of antidysenteric sera are not as satisfactory." This points to the possibility that the antiserum which has been prepared from a mixture of the Shiga bacillus and one or more Flexner strains may not be strictly specific for the actual member of the dysenteric group responsible for the infection—the antiserum, moreover, being "chiefly antitoxic for the treatment of the profound toxæmia that may occur in the disease."

It is regarded as a practical impossibility to examine bacteriologically all cases of dysentery occurring among troops on active service. Delay previous to bacteriological examination of dysenteric stools will almost certainly lead to negative results. Granted, however, the *most favourable conditions*, it is claimed that "a competent bacteriologist can determine whether an infection is due to the Shiga or Flexner bacillus in 12 to 16 hours."

From experience of the disease in Gallipoli and Macedonia, the vast majority of the severe cases of bacillary dysentery are regarded as attributable to the Shiga bacillus; results also showed that the bulk of the mild forms were due to Flexner infection. As the life of a dysentery patient may depend on the earliest possible administration of antiserum, it is suggested that, if every case requiring serum therapy

received the mixed antiserum at the onset, and all proved Shiga cases, the severe cases as well as the others might be given anti-Shiga serum, when better results would be obtained. Flexner cases also could, if necessary, be treated with the appropriate antiserum.[1] Particular stress is laid on the necessity for every effort to produce an efficient and standardised anti-Shiga serum which could be administered on the same lines as antidiphtheritic serum, thus avoiding excessive dosage with horse serum, in place of relying on "antiserum which may or may not possess an efficient neutralising action on the Shiga toxin."

Contamination of Water by Dysenteric Organisms.

Experiments on the vitality of the Shiga bacillus in sterilised, crude river and aqueduct waters led to the following important conclusions being drawn: That the Shiga bacillus can be recovered from stored sterile water for a considerable period and will live and multiply in stored water, especially if kept at low or medium temperature, retaining both its cultural and agglutinative characteristics. The false sense of security, imparted by the belief that water once sterilised or chlorinated will remain so indefinitely, is exposed by the experiments which resulted in the recovery of *B. Shiga* from water so treated but subsequently infected. Hence, owing to inefficient protection from such sources of contamination as dust, flies, &c., water, relied upon as fit for consumption, may prove a source of real danger.

Flies and Dysentery.

The final section of a valuable and illuminating report is occupied by a detailed account of the rôle of the fly as a carrier of bacillary dysentery. This paper, supplied by Captain J. F. Taylor, R.A.M.C., embodies observations and charts giving the incidence of flies compared with incidence of bacillary dysentery arising in the same area, showing a close correlation between the two. Accounts of experiments and particulars of bacteriological examinations in 50 batches of flies, prove that the fly is capable of carrying both Flexner and Shiga bacilli as well as fæcal organisms. The flies' fæces provided the most favourable source for the isolation of dysentery bacilli at and after 24 hours from the time the flies were fed on infectious material. It was also found that, after contact with food contaminated with dysentery bacilli, flies were capable of carrying and disseminating the organisms for at least 24 hours, and were also proved to be carriers when living under natural conditions.

The opportunity of reading in detail this comprehensive study of bacillary dysentery should be taken by all those of our readers who have reason to be interested.

CONTROL OF VENEREAL DISEASES.

The Association between Alcoholic and Sexual Abuses.

AN American mission for the suppression of alcoholic beverages, lately become topical under the name of "pussy-foot," is, as is well known, in this country at present. Those comprising it are reported in the press as giving the main reason of the whole movement to be the scandalous state of the American liquor saloon. This is hardly justification for foreign propaganda, while very little detail of the alleged turpitude has been vouchsafed by the mission. Information which seems to bear on that point, however, comes to hand in a short series of articles* contributed before America's entrance into the war, but only now published. According to these, what has caused most scandal is the close relation evinced between alcohol and sexual irregularity. It is widely known, says the author, that the intimate bond between prostitution and the interests of the wine and beer trade has very rightly brought the latter into discredit. Saloons are often the homes of prostitution, while the Chicago Commission on Vice estimated the takings for alcoholic drinks at disorderly houses, brothels, flats, &c., in the year 1910 at over seven million dollars. Certainly some of the liquor trade societies have honourably endeavoured to dissociate themselves from this traffic. For example, the united breweries of Chicago, the Illinois Liquor Dealers' Association, and the Wholesale Liquor Dealers' Association have pronounced against the sale of their goods in connexion with the ends of prostitution. But there are many dealers who do not share this attitude. An hotel in the large city from which the author writes, belonging to a multi-millionaire, a former Senator, had so bad a reputation that no respectable person was seen there, at any rate in the evening. The manager of it regarded things as being unexceptionable if decorum were outraged no more seriously than by sexual intercourse taking place in the lifts. When in 1914 the State referendum was held very many moderate drinkers voted "dry" merely in order to secure a cleaner moral atmosphere. This factor, much more than the female vote, contributed to its victory by an 8000 majority. The sale of alcohol on pleasure steamers, some of which carry as many as 5000 passengers, also goes hand-in-hand with sexual debauchery. The report already mentioned is cited as giving many cases where persons of opposite sex were found lying drunk together in the cabin bunks. The New York police succeeded in closing a number of "cider cellars" in the east end of that city, but some still remain. The waitresses here were prostitutes for the customers. Dance halls, too, frequented by loose women, made a prominent feature of selling alcohol. Again, at the houses of assignation found at a distance from large cities, often arranged so as to look like farmhouses, and reached by motor-car—the Vice Commission of Massachusetts is quoted as mentioning a whole fleet of automobiles visiting such places—in these the sale of alcoholic drinks assumes large proportions. An aggravating circumstance, in almost all the above instances, is the freedom with which those who are hardly, if any, more than children seem to get access to these places for vicious purposes. Such a circumstance would undoubtedly act strongly in producing a state of public opinion such as, to make total universal prohibition possible, must actually exist; and the feeling in this direction has been contributed to by the publications of the bureaus of social hygiene established by the Rockefellers and others. We cannot follow the author into his examination of other causes of sexual laxity and of political and police corruption; but if his statements are confirmed, it seems evident that the morals of America in a desperate state required a desperate remedy, which total prohibition might turn out to be. Other communities not in the like case may not feel called upon to adopt so violent a measure.

The Venereal Clinic in Liverpool.

The scheme for the free treatment of venereal diseases, which was inaugurated in 1917 under the Regulations of the Local Government Board, has proved a great success in Liverpool, and the majority of the clinics are working well and attracting large numbers of patients. We learn this from the last annual report to his authority of Dr. E. W. Hope, the medical officer of health. The suppression of quackery under the Venereal Diseases Act, 1917, has proved of value in assisting the development of these treatment centres. The great defect of the present system, however, is that no compulsion can be exercised on patients to complete their cure, and large numbers of syphilitic and gonorrhœal cases give up treatment when the local manifestations of the disease have subsided and they are in comparative comfort. Many objections have been raised against including these diseases amongst the list which is notifiable, and certainly some of these deserve consideration. There is a growing feeling, however, that something must be done to compel attention on the part of the sufferer to his complaint and his danger to others, and that restrictions are necessary upon the diseased person whose habits of life are such as to disseminate venereal diseases. Dr. Hope has put forward certain suggestions on the subject which have been fully endorsed by the Liverpool Health Committee. Briefly, his object is to secure compulsory continuation treatment for sufferers from venereal diseases. It would be the duty, under his scheme, of every person who knows or has reasonable grounds to believe that he is suffering from venereal disease to consult a medical practitioner and to conform to the requirements of medical treatment. The recommendations provide for the patient's incognito being secured as long as

[1] The adoption of a similar line of treatment is also advocated in the pamphlet on Bacillary Dysentery issued by the War Office Special Committee early in 1919.

* K. H. Henning: Prostitution und verwandte Erscheinungen in den Vereinigten Staaten von Nord Amerika—Zeitschrift für Sexualwissenschaft, June, July, August, and September, 1919.

he follows the directions of his medical adviser until the disease is pronounced as cured. Should the patient fail to place himself under or to continue medical treatment, it would be the duty of the medical officer of health to take legal proceedings against the delinquent.

The Statistical Method in Relation to Venereal Prophylaxis.

A number of statistics have recently been advanced dealing with the merits of prophylactic and early disinfectant treatment in the prevention of venereal disease. In one such statement, where preventive methods were advocated, the ratio of infection per 1000 men was given as a certain figure; whilst in another instance, where such measures had not been taken, the ratio of infection per 1000 men was represented by another figure. Deductions were then made as to the efficiency of the measures advocated. This method of reasoning is open to fallacy. What we want to know is not the ratio of infection per 1000 men who had or had not been instructed to take certain preventive measures, but the number of infections which took place in 1000 men exposed to infection who did actually adopt preventive measures on the one hand, or did not do so on the other. To obtain these figures may not be easy, but if obtained they would preclude the drawing of deductions from fallacious data.

The Anti-venereal Campaign in Ulster.

A meeting summoned by the executive of the Ulster branch of the National Council for Combating Venereal Diseases was held in the City Hall, Belfast, on Oct. 31st (the Lord Mayor presiding) to hear an address from Mr. E. B. Turner, chairman of the medical committee of the National Council, on the official lines of the National Council's programme—that is, educative, social, and moral. Professor J. A. Lindsay referred to the efficient scheme of the corporation for the treatment of the disease. Mr. Turner having been thanked for his address, Colonel A. Fullerton, in moving a vote of thanks to the Lord Mayor for presiding, referred to his experience at the front, and advocated strongly the sympathetic treatment of affected persons.

A Cinema Film.

A film entitled "The End of the Road," well known in America, has recently been privately presented on two occasions for inspection by those interested in the medical and sociological aspects of venereal disease on the one hand and by the cinema profession on the other. The producers are to be congratulated on the technical skill which marks their venture. It remains to consider to what extent the film is satisfactory from the educational aspect.

The story implicates the life-history of two children, Vera and Mary. Both ask their mothers the inevitable question as to the genesis of babies. Vera's mother puts off her daughter with one of the conventional fables, whereas Mary is given a true explanation, expressed in an idealistic manner. The careers of the two children are then illustrated. Vera eventually contracts an illicit relationship and Mary takes up the profession of sick nursing. In the course of her work the latter comes across her old friend Vera, now forsaken and infected with syphilis. In order to persuade her to undergo the necessary treatment Vera is taken through the wards of a lock hospital by Mary and a Dr. Bell (who wishes to marry Mary), where she is shown patients suffering from syphilis in peculiarly loathsome forms, the result of neglect in the earlier stages. In addition to this main theme there are subsidiary ones, as, for instance, the representation of a married man whose child is blind, and whose infected wife has to undergo an abdominal operation, vividly portrayed on the film.

Is such a representation in its present form calculated to serve any fundamentally good purpose? We feel that far too much stress is laid upon the factor of fear in the prevention of promiscuous intercourse, and far too little upon idealism as a deterrent. The picture is out of proportion, inasmuch as the destructive effects of disease are shown in a far more vivid and terrible manner in the case of woman than of man. The introduction into the film of a woman in the pre-operative stage, and the representation of an abdominal operation upon her, will be felt by many to infringe the canons of good taste. But it is not a matter of good taste so much as of good results. Possibly those responsible for recommending the production do not realise the effect which will be produced by the horrible upon the lay mind. If this film is released in its present form it will be seen by women and by children over the age of 14. The impressions of fear and disgust which may be permanently imprinted on their minds may outweigh the possibility for doing good, which undoubtedly would exist were the representation to be purified by the removal of these irrelevant blotches. That many spectators may come away with a loathsome fear at their hearts is certain, but that any will leave with any strengthening of that factor of idealism which is normally present in everyone is much less sure. Those who are engaged, and most worthily engaged, in the campaign against venereal disease should, we think, take great care not to lose their sense of proportion. Can they not see what the effect is likely to be when the public is suddenly confronted with the grosser aspects and results of disease?

One further point of detail. We take it that the inculcation of caution in dealing with syphilitic cases should be one of the functions of any such film as we are considering. Is this result achieved when the public see a representation of a medical man taking a spatula out of his pocket, examine therewith (without any sterilisation) the throat of a syphilitic patient, and then (again without cleansing) returning the instrument to his pocket?

We should like to revisit this film after it has undergone a healthy process of expurgation and thus rendered more effectual for its excellent purpose.

IRELAND.

(FROM OUR OWN CORRESPONDENTS.)

The Housing Problem in Belfast

THE housing problem in Belfast is surrounded with many difficulties. The corporation, believing that 5000 houses are needed immediately, find that prices have so increased that a style of house such as the Local Government Board prescribe cannot now be built for the money, that the working-classes will not pay a sufficient rent, and that, as a result if such a scheme is taken in hand, the rates of the city will be increased by £100,000 a year. What is known in Belfast as a "kitchen house"—that is, one in which the kitchen is the living and cooking room, with two or three bedrooms and a small scullery and no bath—could in pre-war times have been built for £140; now the same house will cost £510, while the dwelling suggested by the Local Government Board would cost much more. The corporation contend that the cost of the suggested official scheme renders it prohibitive. The health reformers and the various women's organisations reply that in view of improving the city's health (and in this present epidemic there have been nearly a thousand cases of scarlet fever) cost must not be considered; they urge the erection of a much higher type of house, and condemn utterly the "kitchen" form of house, which they regard as obsolete and as a hotbed for breeding disease, while they point to the health statistics of last year in Belfast, with its higher general death-rate and increased tuberculosis death-rate, and high infantile mortality. The working classes seem to be divided, some being content, as at present, with the "kitchen" type of house, others wishing for a much better kind, but all are agreed to pay no more rent than in pre-war times. The question is at bottom a financial one, and can easily be settled if all parties—the State, the capitalist, the employee, and the ratepayer—are prepared each to contribute a fair and equitable financial share in its solution. A mistake in the erection, say, of a poor type of house, would be fatal and, would in the end, through the continued prevalence of disease, cost the city far more than boldly facing the question at present. At a meeting of the Housing Committee of the City Corporation of Belfast, held on Nov. 10th, a resolution was passed asking the Local Government Board to make modifications in their official house plans, by which the cost of the house could be reduced. It appears that the Local Government Board's suggested type of house would to-day (Nov. 10th) cost £950, and the price is steadily rising.

The Scarlet Fever Epidemic.

The present scarlet fever outbreak is the most widespread and most extensive that has ever prevailed in Belfast, there

having been up to the present 930 cases admitted to the two fever hospitals. Two weeks ago the admissions were in one week 199; the figure has fallen in the last two weeks —i.e., up to Nov. 7th—to about 140 in each week. If to the total numbers in hospital those being treated at home be added certainly not less than 1000 people in Belfast have, since the epidemic began in August, been attacked with scarlet fever. Fortunately, the death-rate is not high—about 5 per cent.—and every week now a large number will be discharged. The greatest care is being taken in the two hospitals (the municipal one at Purdysburn, and the Union Workhouse Fever Hospital) to deal with such an unprecedentedly large number of patients, and it is unfortunate that two of the younger resident medical staff have taken the disease while at duty.

CANADA.

(FROM OUR OWN CORRESPONDENT.)

Canadian Military Patients in England.

SPEAKING in the House of Commons, Ottawa, the other day, the Minister of Militia said that the total number of Canada's forces demobilised by Sept. 30th, 1919, had reached to 338,823. The total number of hospital patients still in England on Sept. 19th was 126. There are still 6598 patients in the military hospitals in Canada. The Minister also made the important announcement that not a single casualty had been sustained by the Canadian forces at sea, and that only three men had been killed on Canadian railways during the period of the war.

New Tuberculosis Sanatoriums.

The Canadian Association for the Prevention of Tuberculosis held its nineteenth annual meeting at Ottawa, Canada, on Oct. 9th and 10th last, when the secretary, Dr. George D. Porter, reported that during the past official hospital year a number of institutions had been added to existing institutions in Canada for tuberculosis work. He instanced the new Laval Hospital at St. Foye, Quebec, costing $250,000; the Rotary Institute for diseases of the chest, opened in Vancouver, B.C.; a large provincial institution in Alberta; a new hospital for curable cases in Montreal; new babies' wards at the I.O.D.E. Preventorium in Toronto and Saskatchewan. Great advances had also been made in the Soldier's Civil Re-establishment in conjunction with the University of Toronto Research Department for carrying out of serological tests on both military and civilian cases. Many delegates were present from every province of the Dominion of Canada.

Military Mental Cases in Canada.

Major E. H. Young, in charge of the hospital for insane soldiers at Coburg, Ontario, Canada, the only hospital of this sort in the Dominion, gave a résumé of the work and equipment of the institution at the annual meeting of the Canadian Medical Association. Major Young stated that the hospital had 425 beds, and that it received most of its cases from other military hospitals in the Dominion. Overseas the cases were received by the medical officers and skilled N.C.O.'s detailed from the Coburg institution, and thus have been taken charge of right at embarkation. On reaching Coburg they are assigned to a suitable ward, the admission being completed expeditiously and without formality. There are seven medical officers at the Coburg institution, and in June last the number of patients was 236. No patient is discharged until the opinion of the medical staff is secured. In all, 800 cases have appeared before this board, and 400 have been sent back to civil life. Twelve hundred cases have altogether been admitted and cared for, and no serious accident has marred the history of the institution under a system of non-restraint. If the C.A.M.C. can care for this class of patient so successfully, then in the larger general hospitals of Canada there should be psychopathic wards where similar work could be carried on.

A Dominion Council on Public Health.

Canada has established a Ministry of Health at Ottawa; and for the present it is under the charge of a responsible Minister of the Crown—the Hon. Newton Wesley Rowell. Dr. John Amyot, formerly professor of hygiene and preventive medicine in the University of Toronto, who was sanitary officer with the Canadian overseas forces for several years, has been appointed Deputy Minister. By the Act establishing the Department of Public Health a Dominion Council was established for public health as an advisory body for the department. This met in its first annual convention early in October. It consists of the chairman and chief executive officer of each provincial board of health, together with two representatives of women's activities and a representative each of agriculture, and academic, military, and labour interests. Among the chief subjects discussed at this conference were: Control of the venereal diseases, in reference particularly to the Dominion grant towards this object; measures against influenza; industrial hygiene; rural hygiene; habit drugs.

An Advisory Health Department on Patent Drugs.

To comply with the requirements of the new amendments to the Federal Proprietary and Patent Medicine Act the Deputy Minister of Health at Ottawa has been successful in having an Order in Council passed appointing the following as an advisory committee to the department: Dr. A. D. Balckade, professor of pharmacology in McGill University; Dr. Robert D. Rudolf, professor of therapeutics in the University of Toronto; Dr. A. McGill, chief analyst for the Federal Government; Dr. E. W. J. E. Lecours, professor of Laval School of Pharmacy, Montreal; Dr. Charles F. Heebner, Dean of the College of Pharmacy, Toronto.

Financial Support for the Control of Venereal Diseases.

That the Federal Government of Canada is taking a keen interest in combating the spread of venereal diseases in Canada is shown by the fact that they have apportioned $200,000 for distribution to the various provincial boards of health. $10,000 of this sum will go to the National Council for the Suppression of Venereal Diseases; $10,000 for the Dominion Department of Health; the balance of $180,000 will be distributed amongst the provinces in ratio of population, provided the various provincial governments are willing to contribute equal amounts for the same purpose. Under this scheme it is intended to establish laboratories where diagnosis might be made, these to be open to the whole medical profession for free use. Public clinics will also be established under the scheme, and the campaign will be carried into all general hospitals and institutions receiving cases.

Toronto, Oct. 15th.

SWITZERLAND.

(FROM OUR OWN CORRESPONDENT.)

The Position of the General Practitioner.

THE position of the general medical practitioner in Switzerland is becoming more and more unsatisfactory from decade to decade. In the first instance, the great increase in the number of benevolent societies (Krankenkassen) caused a considerable reduction in medical incomes. Happily, owing to the strenuous efforts of the medical profession, the German practice of appointing Kassenärzte with a fixed rate of income and an unlimited number of patients was avoided, and therewith the absurdity of a consultation at 20 and a visit at 50 pfennigs. In Switzerland the benevolent societies remunerate medical visits at a minimum of fr.2 and consultations at fr.1.50, with fixed extra charges for surgical and other specialist services. Every practitioner with the Swiss federal diploma has a right to apply to have his name put on the list of these practitioners after one year's practice. The appointment as factory doctors paid at a fixed rate has remained almost entirely limited to certain country districts. In consequence of severe and general criticism, the matter is now under the consideration of the General Medical Council.

Six months ago medical fees, which differ from canton to canton, were raised 30 per cent., and a further rise of at least 20 per cent. is foreseen owing to the great increase in the cost of living, variously estimated at 80 to 120 per cent., as compared with the year 1914.

Competition by women practitioners, who are almost exclusively of Swiss nationality, is playing an increasing rôle. Out of 119 general practitioners in Zurich (population 212,000) in 1918 17 were women. In special departments, too, rivalry is increasing. In Zurich out of a grand total of 223 names in the medical directory 114, or one-half, are those of specialists. A large proportion of these also

engage in general practice, and as their fees for consultation vary from fr.5 to fr.10, the financial position of the practitioner, who is only legally entitled to charge fr.3–5, suffers accordingly. Efforts, the issue of which is doubtful, are being made to enforce distinct examinations for specialists and to prohibit them from engaging in general practice.

Last, not least, the out-patient departments in the large hospital towns have proved detrimental to the financial interests of the profession, as not only can patients, without any control of their income, consult the department free of charge, but the municipal authorities have subsidised practitioners to attend so-called indigent persons, many of whom could quite well join a provident society. It is estimated that in a town such as Zurich one-fifth to one-fourth of the population is treated free of charge and receives drugs supplied by the State.

The General Medical Council of Switzerland has its work cut out to deal in a satisfactory way with these difficult problems, some of which, indeed, cannot be solved, as they are an index of the democratic and socialistic wave which is sweeping over Europe.

Zurich, Nov. 1st.

Public Health.

ANNUAL REPORTS OF MEDICAL OFFICERS OF HEALTH.

City of Liverpool.

Dr. E. W. Hope's annual report for the year 1918 contains much interesting material relating to health conditions in the city. The birth-rate, which has been gradually declining for the past 25 years, fell rapidly from 30·0 in 1914 to 21·9 in 1918. This sudden fall may be attributed to war conditions, and it is rather a melancholy fact that nearly 15,000 fewer infants were born during the years of war than would have been the case had the 1914 rate been maintained. The year 1918 will always be memorable to those interested in epidemiology on account of the pandemic of influenza. Like most other districts, Liverpool was visited by the severest outbreak of the disease ever known in the city. Neither age, sex, social position, nor physical fitness afforded protection against attack. The initial indication of any unusual mortality from respiratory diseases was the occurrence, in the first half of the year, of an unusual number of cases of pneumonia with high fatality amongst coloured seamen in certain boarding houses in the south end of the city. Between January and June there were no fewer than 81 such cases, with 22 deaths. The deaths were not certified by the medical men in attendance as due to influenza, but in the light of subsequent events it would seem probable that at least a proportion of them were occasioned by that disease. It is also noteworthy that it was in the south end of the city that outbreaks among school children first necessitated school closure in June.

There were four epidemic waves of influenza in Liverpool. In May the first definite, though small, wave occurred, a few deaths from the disease being accompanied by a distinct rise in the number of deaths ascribed to pneumonia and broncho-pneumonia, and by a rise in the death-rate from respiratory diseases generally as well as in that from all causes. During this month a considerable number of persons suffering from influenza were landed at the port of Liverpool, and there was, of course, an outbreak of the disease in Spain. The second wave occurred during July at a time when influenza was prevalent in many parts of Europe and North America. In August and September the number of deaths from influenza fell, but rose to a third maximum in the week ended Oct. 26th, when 204 deaths from influenza were recorded and 170 from pneumonia and broncho-pneumonia. The respiratory death-rate was 14·5, and the total death-rate reached 41·8 during this week. It is interesting to note that an influenzal wave was occurring simultaneously in London, Paris, and New York during the period of the third wave in Liverpool. The fourth wave in Liverpool reached its maximum in the week ended Feb. 22nd, when the respiratory death-rate was 16·0 and the total death-rate 42·5. Each succeeding wave was separated by a longer interval from the preceding one, but it was also more severe. The interval between the first and second maxima was nine weeks, that between the second and third was 14 weeks, and that between the third and fourth was 17 weeks.

There were 1388 deaths certified as due to influenza during 1918, giving a rate of 1·77 per 1000 of the total population. It is impossible to give accurately the full total number of deaths caused by the disease, as the name influenza only appears in a proportion of the certificates relating to deaths in the cause of which influenza was probably a factor. Comparing the number of deaths from respiratory diseases in 1917 and 1918, the excess in the latter year, amounting to 2376 deaths, may fairly be attributed to influenza. Yet even this high figure probably falls short of the total number, because it is probable that in many instances sufferers from other diseases succumbed to an added attack of influenza too obscured and ill-defined to be regarded as the actual or primary cause of death.

A considerable number of pregnant women died from influenza. During the period Oct. 12th to Dec. 31st 95 such deaths came under observation, and the circumstances associated with each were carefully investigated. It would appear that during this period the death of the mother caused the death of the unborn infant in 63 instances, and of the children born alive 24 were premature. When the six months period October, 1917, to March, 1918, is compared with the corresponding period of 1918 and 1919 it is found that there is an increase in still-births of 60 during the latter period, causing a rise in the relative proportion of still to live births of from 3·5 to 4·3 per cent.

As to the means by which the disease was introduced into Liverpool it should be noted, in the first instance, that there was a gradual rise in the number of deaths from influenza during 1914, 1915, and 1916, showing that the disease was present in the city and was increasing in severity. There is evidence to show that influenza was reintroduced in a severe form early in the year 1918 by means of shipping, and the number of cases of pneumonia among coloured seamen has already been referred to. Subsequently very large numbers of cases of the disease occurred on transports bringing American and other troops. Whilst the soldiers were removed to military hospitals when acutely ill, there can be little doubt that convalescent cases, though possibly still infectious, mingled with the general population. Moreover, the crews of these transports and other vessels were also affected, and with the great pressure on the hospitals of the city, and the use of two of the largest fever hospitals for military purposes, the utmost difficulty was experienced in obtaining hospital accommodation, even for those severely ill. This undoubtedly led to repeated reintroductions of the infection.

County Borough of Salford.

Dr. C. H. Tattersall's annual report for 1918 also contains account of the influenza epidemic. There were two epidemic waves in the borough during the year. The first, or shorter wave, commenced about the middle of June and lasted till the end of July. The second and more prolonged wave commenced about the middle of October and had practically died away by the end of December. It may be convenient to review the circumstances associated with the two waves separately. In connexion with the first, study of the influenza mortality curve shows a rise from zero to 11 deaths for the week ended June 29th. By the following week-end no fewer than 51 additional deaths had been recorded. This second week proved to be the most fatal, and for the next three weeks there was a continued fall in the number of deaths, the totals being 41, 26, and 3 for the third, fourth, and fifth weeks respectively. There was a slight recrudescence in the sixth week, 7 deaths being then recorded, after which the wave practically came to an end. The heaviest mortality occurred in the age-group 45–55 years, there having been 30 deaths recorded in this age-period. Next in order came the groups 35–45 years and 25–35 years, there having been 28 deaths in each of these; thus the disease took the heaviest toll amongst persons between the ages of 25 and 55—namely, those in the prime of life.

Healthiness or otherwise of occupation had apparently little influence upon the influenza death-rate. Out of 67 male deaths occurring in the first wave, labourers head the list with 17 deaths, seamen coming next with 10 deaths. Of 74 female deaths 50 occurred amongst those engaged in domestic duties. The chief complications occurring in the 141 fatal

cases were: pneumonia in 63 per cent., bronchitis in 10 per cent., gastro-enteritis in 3 per cent., and meningitis in 0·7 per cent. The second wave was more prolonged and attained greater severity than the earlier one. The death-curve rose steeply from the end of October, and attained a maximum of 88 deaths during the week ended Nov. 23rd; thence the curve fell regularly and somewhat precipitately until the week ended Dec. 28th, when only 4 influenza deaths were recorded. The age-group 25–35 years was most affected. Ninety-six deaths occurred in this group. Next came the 15–25 years age-group with 72 deaths, whilst 52 deaths occurred in the age-period 35–45 years and 45 deaths in group 45–55 years. Thus, as compared with the first wave, the younger section of the population suffered more severely.

Of the 173 male deaths, the largest number (44) occurred amongst infants and school children, labourers coming next with 19 deaths. Out of 242 female deaths, 118 occurred amongst those engaged in domestic duties, and 59 amongst infants and school children. As in the first wave there was no evidence as to the predisposing effect of so-called unhealthy occupations. The relatively large proportion of deaths amongst seamen (10 out of 67 male deaths in the first wave and 10 out of 173 male deaths in the second wave) might suggest a special susceptibility of Lascars to the infection. This susceptibility may be either inherent in the race, or acquired through insufficiency of nitrogenous elements in the diet.

The chief complications in the 415 fatal cases in the second wave were: pneumonia in 72 per cent., bronchitis in 10 per cent., gastro-enteritis in 0·2 per cent., and meningitis in 2 per cent.

URBAN VITAL STATISTICS.

(Week ended Nov. 8th, 1919.)

English and Welsh Towns.—In the 96 English and Welsh towns, with an aggregate civil population estimated at 16,500,000 persons, the annual rate of mortality, which had been 12·5, 13·7, and 12·9 in the three preceding weeks, rose to 13·4 per 1000. In London, with a population slightly exceeding 4,000,000 persons, the annual death-rate was 15·1, or 0·8 per 1000 above that recorded in the previous week, while among the remaining towns the rates ranged from 4·9 in Merthyr Tydfil, 5·5 in Enfield, and 6·0 in Smethwick, to 18·1 in Bury, 18·5 in Bournemouth, and 21·0 in Sunderland and in Gateshead. The principal epidemic diseases caused 229 deaths, which corresponded to an annual rate of 0·7 per 1000, and comprised 78 from infantile diarrhœa, 56 from diphtheria, 54 from measles, 21 from scarlet fever, 19 from whooping-cough, and 2 from enteric fever. Measles caused a death-rate of 1·5 in South Shields, 1·8 in Rochdale and in Gateshead, and 2·2 in Barnsley and in Sunderland; and diphtheria of 1·3 in Walthamstow and in Bolton, 1·6 in Rotherham, and 1·9 in Northampton. The deaths from influenza numbered 56, against 71 in each of the two preceding weeks, and included 18 in London, 4 in Sheffield, and 3 each in Bristol and Bradford. There were 2540 cases of scarlet fever and 1433 of diphtheria under treatment in the Metropolitan Asylums Hospitals and the London Fever Hospital, against 2351 and 1428 respectively at the end of the previous week. The causes of 46 deaths in the 96 towns were uncertified, and included 5 each in Birmingham and Preston, and 4 each in London and Gateshead.

Scotch Towns.—In the 16 largest Scotch towns, with an aggregate population estimated at nearly 2,500,000 persons, the annual rate of mortality, which had been 12·3, 11·1, and 12·4 in the three preceding weeks, further rose to 13·1 per 1000. The 261 deaths in Glasgow corresponded to an annual rate of 12·2 per 1000, and included 8 from infantile diarrhœa, 5 from measles, and 3 each from scarlet fever and diphtheria. The 85 deaths in Edinburgh were equal to a rate of 13·2 per 1000, and included 2 each from measles, scarlet fever, and diphtheria.

Irish Towns.—The 99 deaths in Dublin corresponded to an annual rate of 12·7, or 5·1 per 1000 below that recorded in the previous week, and included 2 each from measles and infantile diarrhœa, and 1 from diphtheria. The 159 deaths in Belfast were equal to a rate of 20·7 per 1000, and included 10 from scarlet fever, 4 from measles, and 3 from infantile diarrhœa.

THE PEOPLE'S LEAGUE OF HEALTH.—The fifth meeting of the Medical Council was held at the Savoy Hotel on Thursday evening, Nov. 6th, when Dr. A. E. Giles called particular attention to the crying need of the country for maternity homes, Miss Olga Nethersole, the honorary organiser of the league, vouched for the sympathy of the Queen in this matter, and the feeling of the meeting was that the founding of such homes would form an excellent war memorial.

Mr. E. B. Turner, the chairman of the National Council for the Combating of Venereal Disease, said that a whirlwind was necessary to shake the public apathy, and Dr. E. H. M. Stancomb, in confirming this opinion, added that it was amazing that people would pay Charlie Chaplin £300,000 to make themselves laugh and hesitate to put up any money to keep themselves healthy.

The council has decided to issue in collective form papers by specialists on the need of education for the raising of the standard of health of the nation.

Correspondence.

"Audi alteram partem."

THE BRITISH FEDERATION OF MEDICAL AND ALLIED SOCIETIES.

LATE "MEDICAL PARLIAMENTARY COMMITTEE."

To the Editor of THE LANCET.

SIR,—Permanent offices have now been secured for the Federation, where inquiries from those interested will be welcomed at any time. The following terms of subscription for associations, societies, or other bodies desiring to appoint representatives on the Council have now been adopted, after the issue of provisional terms and after ascertaining the views of the various societies, &c., provisionally constituting the Federation:—

Members of society, &c.	Entrance fee.	Annual subscription.
5,000 or over	5 guineas.	10 guineas.
3,000 " "	4 "	9 "
1,000 " "	3 "	8 "
500 " "	2 "	7 "
100 " "	1 "	5 "

As the constitutions of some societies preclude the use of their funds for subscriptions to such organisations as this, it is suggested that individual members of such societies who sympathise with the aims of the Federation might be invited to make up the required subscription by private contributions.

In view of the desire to make the representation as wide as possible, any society or body, whether medical or lay, concerned in public health matters which finds the above terms beyond its means is invited to make an alternative offer. Higher subscriptions than those stated will, of course, be equally acceptable.

Policy of the Federation.

Seeing that no organisation exists within the medical profession which can truly be considered to represent that profession *as a whole*, and that no organisation exists which embraces the medical, dental, nursing, and pharmaceutical professions, it follows that medicine itself, and those allied with it in guiding public opinion on health matters, have no common channel of utterance, and are ununited to meet the evident dangers inseparable from the reconstruction of the health services of the country. If we as a profession are too apathetic to insist on our right to participate in framing the laws which will regulate our future labours we shall have no reason for complaining later that those laws have been drawn up contrary to our interests and the interests of our patients. The Federation is in antagonism with no existing organisation, but it realises that medicine cannot attain the power to control its own destiny by the agency alone of any of them. It seeks no executive power over those societies or other bodies which constitute it, and does not concern itself with the internal affairs or policies of those societies.

The initial difficulties inseparable from such a movement have now been overcome, and already a large measure of support has been secured. The widely representative executive, elected from and by the constituent societies, is keenly alive to the emergency of the moment, and it only remains for *all* sections to coöperate in obtaining for medicine and its ancillaries that unity without which we are but as chaff before the wind.—We are, Sir, yours faithfully,

CHARLES BUTTAR,
Hon. Secretary;
N. HOWARD MUMMERY,
Organising Secretary.

5, Vere-street, Cavendish-square, London, W. 1, Nov. 10th, 1919.

A PERSONAL EXPLANATION.

To the Editor of THE LANCET.

SIR,—I have been extremely distressed to see, in the course of a report of an address that I gave, some sentences that are most insulting to the R.A.M.C. The address was not read but spoken from pencil notes, and it is not easy to recollect accurately, and impossible to verify, what I then said. My point was, and I believe it to be true, that official

administration will not improve medical practice. The conditions at the Flanders front in the early months of the war occurred to me as an instance. The Regulars were practically all employed in administration, and the treatment of the patients was in the hands of temporary officers who, having but just joined the R.A.M.C. from civil life, were not at first at home in the novel and difficult conditions of war. They needed guidance, and it was not any official action but the teaching and efforts of the consulting surgeons, who were at that time civilians—for the one Regular consultant was appointed much later—which rapidly raised the practice of these young officers to a level which has, I believe, never previously been attained in war. Nor did the official authorities realise without the advice of the consulting surgeons the importance of the rôle which the clearing stations were to play. Of the second class of surgeons at the front, the surgical specialists, only, I think, two, and of the medical specialists not one, for the reason given above, could be drawn from the Regulars. It was, therefore, fortunate that civilians were available to conduct the treatment of the army. I further repeated, on the same line of argument, a statement often made by public servants themselves, and recent instances will occur to every one, that in Government service innovation is not viewed with favour, whereas in medicine it is essential that new methods should be constantly tried. I drew the conclusion that an atmosphere of official control is bad for a scientific profession. I said all that, and am prepared to say it again, but you will observe that although the report gives much the same words, the impression conveyed is very different.

I have no doubt that I am myself greatly to blame for not making my meaning clear. But when I consented to allow a short account of my address to be given to you I did not anticipate that what has the air of a verbatim report would be sent you, and still less that you would print it without my knowledge and without my correction. Had I seen it, it is hardly necessary to say that the whole paragraph would have been erased, not only because it is insulting to the Corps as a whole and to many of my personal friends, including the Regular consultant who was my own colleague, but also because it neither represents my meaning at the time, nor my settled opinion of the Corps. If anyone cares to know what that is they will find it in a book I have just published, where beside many scattered passages there is a special chapter on the subject. The opinions may be disputed, but I hope that at least they are not offensively expressed.

I regret to trouble you with a matter which, though it has given me the deepest distress, is after all of no great importance to anyone but myself.

I am, Sir, yours faithfully,

Nov. 10th, 1919. W. P. HERRINGHAM.

*** The wording of the report was brought to the attention of our colleague who wrote it, who has sent us the following: "Lest there should be any misapprehension about Sir Wilmot Herringham's remarks at the meeting of the Norwich Medico-Chirurgical Society, reported in THE LANCET of Nov. 1st, it should be stated that the speaker had clearly no intention of casting any slur on the abilities of the R.A.M.C. Undoubtedly by 'second-class surgeons' and 'absence of physicians' he was understood to mean that with so small a personnel it was impossible to have consulting surgeons of first-class rank on all the special sides, while it was not the skill of the physicians that was absent, but the actual men themselves, the personnel being so very small and the sick so very numerous. In these circumstances the additional help given by leading civilian consulting physicians and surgeons was extremely valuable."—ED. L.

FRIENDS' EMERGENCY AND WAR VICTIMS' RELIEF COMMITTEE.

To the Editor of THE LANCET.

SIR,—May I call the attention of your readers to the fact that the Friends' Emergency Committee (Foreign Fund) and the Friends' War Victims' Relief Committee have now been united under the name of the Friends' Emergency and War Victims' Relief Committee? This brings the whole of the foreign relief work of the English Society of Friends under one committee and this organisation works in close coöperation with the American Friends' Service Committee—a similar body with even wider functions. The tide of the work flows eastward. In France, where help has been given continuously for five years, the need for emergency work is lessening. In the two devastated cantons near Verdun, in which we were asked by the French Government to work, wooden houses have been built, medical aid has been given, shops have been opened and handed over to a local coöperative society, land has been ploughed, and help too diverse to enumerate has been organised. The 550 workers are already diminishing, and it is anticipated that only a comparatively small band of relief workers will remain through the winter. The permanent reconstruction will, of course, take years to accomplish, and is beyond the power of a voluntary organisation.

Moving eastward one finds ruined children's bodies instead of ruined houses. The tragedy of Vienna is too overwhelming to depict here, but, in brief, the results of years of under nourishment may be seen written on practically every Viennese child, and unless help is given quickly and thoroughly many must be doomed to a crippled invalid life or to death. Food and coal are the most crying needs of this great city, and these needs must be met if disaster is to be averted. Unhappily, the commodities most needed are, under existing conditions, the most difficult to obtain. Our workers are coöperating with a committee on the spot in the distribution of supplies furnished from England, and are also engaged in various schemes for obtaining increased supplies of milk and for making of clothes, in which it is expected that barter will be resorted to owing to the extreme depreciation of the krone. All that has been said about the conditions in Vienna applies with almost equal force to the conditions in Germany, where the Committee is doing what little it can to send relief and to foster a spirit of reconciliation.

In Poland, too, a Unit is at work, the first foreign Unit, it is understood, to take up the much needed work of disinfection against typhus. More than 6000 soldiers civilians, and children have been disinfected, and their immunity from disease thereby greatly increased—a matter of vital importance—for with the coming of the cold weather there is almost certain to be a recurrence of typhus. In addition to this the Unit is arranging for the distribution of clothes, and is starting workshops in which they will be made, as well as a dispensary for child patients. All this work is badly needed, as the utter rags in which people go about, and the sad condition of the children show only too clearly.

This, in barest outline, is the work already being carried on by the Relief Committee. Schemes for its extension, if the means are forthcoming, are under consideration. Surely winter can hardly ever have approached with such a black outlook for so many women and children all over Europe. And it is for us who still can eat our good meals by our warm fires to show them that England is a friend to those in trouble.

I am, Sir, yours faithfully,

A. RUTH FRY,
Hon. Secretary.

91, Bishopsgate, E.C. 2, Nov. 4th, 1919.

CONJUGAL TUBERCULOSIS.

To the Editor of THE LANCET.

SIR,—I can quite understand that Dr L. S. Burrell (THE LANCET, Nov. 1st, p. 806) finds it difficult to follow me, because he looks at tuberculosis from the germ point of view and I from the side of environment. The battle between these two issues will have to be fought in the coming days. Meanwhile my contention is that in the majority of cases clinical facts and present-day observations do not warrant us to make any dogmatic statement as to the relation between tuberculosis, tubercle bacilli, and infection, briefly for the following reasons.

(*a*) The discovery of tubercle bacilli does not establish the infectiousness of consumption; it merely explains how infection may, but does not prove how it does, occur.

(*b*) The presence of micro-organisms in connexion with a disease does not necessarily prove they are its cause any more than the presence of eagles near a corpse proves they were the cause of death.

(*c*) Animal experiments with human tubercle bacilli, severe as they are, have not produced the effects and symptoms of natural tuberculosis of the lungs.

(*d*) It is a question if tubercle bacilli can be found in the inspired and expired air in the ordinary surroundings of tuberculous patients. We have tested the air in their rooms and châlets and the results were negative.

(*e*) Among those employed in our sanatorium—medical men, matrons, nurses, attendants, &c., who have daily come into contact with consumptive patients—there is no proof that even a single one has contracted tuberculosis by

such a contact. This, added to a similar experience from other sanatoriums and consumption hospitals, like the Brompton, makes out a strong case of negative evidence so as to throw doubt on the contagion theory.

(*f*) There is no evidence, at least in the majority of cases, that living with tuberculous husbands brings about a greater incidence and mortality among their wives, or vice versa. In fact, we have to face this anomaly, that while there is a high death-rate from consumption among Sheffield grinders and tin-miners of Cornwall, there is a correspondingly low death-rate from the same cause among their wives and their children. (Causes of Tuberculosis, Cobbett.)

(*g*) Coming to some positive facts and observations, recent advances made in biology, physiological, and pathological chemistry, epidemiology, climatology, social economics, &c., have thrown considerable light on tuberculous problems, so as to shift the angle of vision from bacteriology to biochemistry, from microbe to metabolism, from the seed to the soil conditions in man.

(*h*) It is well known that tuberculosis is mostly found among those living in terrible social conditions, such as poverty, bad housing, slums, overcrowding, physical and mental strain, &c. This same fact was emphasised by the late war, where increased tuberculosis mortality went hand in hand with famine, want of proper food and rest, fear and anxiety, &c.

(*i*) Cases present themselves with all the symptoms and signs of pulmonary tuberculosis without the presence of tubercle bacilli, so that we shall have to admit that we can have tuberculosis without tubercle bacilli in the same way we can have influenza without Pfeiffer's organism. (One such case was reported by Sir StClair Thomson in *Tubercle*, October, 1919.)

We cannot fall back upon "resistance" to explain the incidence or absence of tuberculosis, as we do not know what it means. Whatever it is it does not mean physical fitness, for hundreds of men died of influenza who were physically fit and robust and hundreds survived who were tuberculous or unfit. The parrot-cry of "infection," "contagion," "resistance," at anything and everything connected with tuberculosis rather betrays our ignorance than advances our knowledge. The infection theory of tuberculosis will have to be revised by the light of modern thought which diverts attention from external causes to man himself, to his mode of living, his food and digestion, his surroundings, to the physiological and chemical changes that take place in his body by bad social conditions, impaired metabolism and malnutrition, which create a soil favourable to the growth of micro-organisms which, through present in and around us, have no power to do harm except through bad environment. Medical problems of tuberculosis are really social problems. This is why one emphasises social questions in connexion with the disease. Syphilis and scarlet fever do not come under the same category as tuberculosis, because they are not associated with poverty, overcrowding, malnutrition, nor are they treated or cured by improved feeding, &c. The medical profession is apt to cling to old traditions and shibboleths which did duty in the past as if they contained the whole truth. It must discern and move with the signs of the times and open its windows wide to the light which the modern sciences are throwing upon the present-day problems of social and economic life and adjust its ideas of diseased conditions accordingly.

I am, Sir, yours faithfully,

Mendip Hills Sanatorium, Nov. 10th, 1919. C. MUTHU.

RADIUM TREATMENT IN IRELAND.

To the Editor of THE LANCET.

SIR,—There appeared in the *Irish Times* of Oct. 30th a full column appealing for funds entitled "St. Bartholomew's Call to Ireland." The following statement which I extract is misleading, unintentionally I feel confident, and I think not just to the Dublin hospitals which are also badly hit by the war. It says:—

"You in Ireland may regard it as an invasion for this hospital in London to appeal to you, but St. Bartholomew's does not regard it as strange when people travel from Ireland to 'Bartholomew's.' For instance, a man was sent by his doctor in Ireland to St. Bartholomew's, his fingers were contracted, stiffened, and as useless as wooden pegs. Radium treatment at 'Bartholomew's' (not available in Ireland) restored the full use of his hand."

I first used radium in Dr. Steevens's Hospital in 1904 and published,[1] I believe, the first recorded case of treatment by radium of fingers which were contracted, stiffened, and even more useless than wooden pegs, as they kept the patient awake with pain at night. The treatment was most successful; I saw the patient, after five years, a few days ago.

We are fortunate in Ireland to be able to obtain from the Royal Dublin Society Radium Institute radium emanation for the treatment of patients in hospitals and elsewhere. I may add that the radium treatment of stiff hands due to war injuries has been authorised by the War Office on account of my work at Dr. Steevens's Hospital, and at Blackrock, Alder Hey, and Shepherd's Bush Special Military Surgical Hospitals.[2] In addition to some 250 hospital cases treated for malignant disease at Dr. Steevens's Hospital, I have treated with eminently satisfactory results 453 patients (stiff joints, adherent and painful scars, &c.), 349 of them in Ireland. Incidentally, it appears to me obvious from the result obtained at St. Bartholomew's Hospital and my own experience that radium should be much more extensively employed for the benefit of those wounded in the war than it has been heretofore. I feel that these facts have only to be pointed out to the authorities of St. Bartholomew's to obtain justice for our Irish hospitals.

I am, Sir, yours faithfully,

Dublin, Nov. 3rd, 1919. WALTER C. STEVENSON.

[1] Brit. Med. Jour., July 4th, 1914.

PICRIC BRASS IN THE TREATMENT OF LUPUS.

To the Editor of THE LANCET.

SIR,—Dr. Henry Ellis in to-day's issue of THE LANCET deals with a difficulty probably experienced by all who have tried his original brass treatment. Having treated six cases of lupus by this method I gladly bear witness to the specific action of brass in inducing caseation of lupus nodules. Indeed, improvement is so apparent that patients without exception welcome the discomfort of subsequent applications of the paste; and in lupus non-exudens I find that three applications of brass under plaster may be required before caseation occurs. In one of my cases of lupus exudens the entire face was studded with suppurating crusts, and there was ectropion of both lower eyelids.

After the initial and very obvious improvements the results hitherto, in my experience, are less constant. Brass does not appear to affect those areas of induration, to which Dr. Ellis refers as "pseudo-healthy tissue." Now, if picro-sulphanilic acid, having reached these areas, should destroy the tubercle bacillus whilst sparing tissue cells, the problem of contact in the chemico-therapeutics of lupus will, indeed, be solved; but, even so, it remains to be seen whether the degree, as distinct from the area, of cicatrisation marking the track of the disease will be lessened. Unfortunately for our patients there is no healing by first intention in any variety of tuberculosis.

Should picro-sulphanilic acid fail to dispel induration in the rete, I would suggest trying tuberculin treatment in conjunction with brass paste or with "bro," despite the fact that tuberculin alone has proved disappointing in the treatment of lupus. My suggestion is based on the assumption that having destroyed the larger plasma-impervious nodules it is also possible to raise the bactericidal power of the lymph by which all cellular tissues of the body are surrounded. I am, Sir, yours faithfully,

HALLIDAY SUTHERLAND.

New Cavendish-street, W., Nov. 8th, 1919.

CHLOROMA SIMULATING MASTOID DISEASE.

To the Editor of THE LANCET.

SIR,—In your issue of Nov. 8th you publish an interesting note on this subject and I should be obliged if I might comment shortly thereon. The author, Dr. E. Catherine Lewis, very distinctly states that there were no "masses" and no infiltration in the liver. In a series of 1500 cases of leukæmia I have only once before found this stated. It would therefore be very interesting to know how many pieces of liver were sectioned and whether there was any trace at all of round-celled infiltration. The spleen is referred to as being of a "dirty yellowish-brown" on section, while the glands in several regions were enlarged. Yet these "appeared normal" on section. There are in the literature certain cases in which the glands have been declared normal, but this also is a rare finding and, in view of the confusing nature of gland histology, one would like fuller information before adding another to these.

[2] Vide THE LANCET, March 23rd, 1918; Medical Press and Circular, Jan. 8th, 1919; Archives of Radiology and Electrotherapy, April, 1919.

Dr. Lewis has found some 65 recorded cases and she would certainly have to work hard to find so many. But there are, as a matter of fact, more than that. In the series above referred to there were about 100 cases of chloroma and several have been published since. There is also a case in the literature[1] which resembled that of Dr. Lewis in that acute mastoid disease was an early complication. I have not the reference at hand, but I believe the patient was a young man in poor circumstances who was brought to hospital and operated upon forthwith. Operation disclosed masses of a greenish colour pervading the mastoid. Up to this time no blood examination had been made and the nature of the disease was quite unsuspected.

That such occurrences are not more frequent is probably due to the fact that the growths of chloroma are not in the least liable to become septic unless brought into direct association with an old septic focus or an abraded surface. Neither of these occurs very frequently in the ear or, perhaps, one should say the chance of a case of ear disease developing so rare a condition as chloroma is very small. In the case of Dr. Lewis, as in many others of a similar kind from the pathological point of view, I think that the blood findings would now be held to betoken an acute myeloid leukæmia. The large lymphocyte is a somewhat discredited cell, and the name no longer applies to all large mononuclear cells which lack definite granules.—I am, Sir, yours faithfully,

Sevenoaks, Kent, Nov. 10th, 1919. GORDON WARD.

"SOME CONSIDERATIONS OF PREVENTABLE DISEASE": A CORRECTION.

To the Editor of THE LANCET.

SIR,—In the excellent abstract of the presidential address delivered before the Society of Tropical Medicine and Hygiene, which was published in THE LANCET last week, two corrections must be made in my figures. In the section describing the progress of sanitary organisation in India the following figures are given:—"The effect of these and subsequent health measures has been to reduce the death-rate of ..... Indian troops from 20 to 6·78 and of prisoners from 32·7 to 30·8 per 1000." The figures 6·78 should read *4·39*, while 30·8 should read *19·17*.

I am, Sir, yours faithfully,

Nov. 10th, 1919. W. J. SIMPSON.

THE NORTH-EAST LONDON POST-GRADUATE COLLEGE.

To the Editor of THE LANCET.

SIR,—In his address entitled "Some Remarks on Medical Education," published in your issue of Nov. 8th, and referring to the provision in London of post-graduate instruction, Sir George Makins alludes to the work attempted in this direction by the West London and the Seamen's Hospitals, mentioning the circumstance that the teaching in these institutions has been exclusively devoted to medical practitioners. He, however, did not mention another institution which has done similar work during the last 17 years—the North-East London Post-Graduate College attached to the Prince of Wales's General Hospital. Its teaching staff, fearing that this oversight might lead to some misapprehension as to its present position, requested me to write to Sir George Makins pointing out the omission, and he has been kind enough to reply expressing his regret that he did not mention our school at the meeting in Manchester.

It is true that since the beginning of the war formal lectures and special classes have been largely in abeyance, as at the other post-graduate schools, but clinical teaching has been continuously carried on, and although no set syllabus will be issued before Christmas, it is intended that the full activities of the school shall be resumed early in January next, and that they shall, so far as possible, be made to fit in with the larger scheme of post-graduate education now being developed.

I am, Sir, yours faithfully,

ARTHUR J WHITING,

Nov. 10th, 1919. Dean, N.E. London Post-Graduate College.

*** Sir George Makins's addition, including the North-East London Post-Graduate College, did not reach us in time for publication.—ED L.

[1] Koerner: Zeitsch. f. Ohrenheilk., Wiesb., 1896, xxix., p. 92; and Arch. of Otol., New York, 1897, xxvi., p. 289.

A LIVING FOREIGN BODY IN THE LARYNX.

To the Editor of THE LANCET.

SIR,—The case referred to in the Annotations in THE LANCET of Nov. 8th (p. 841) reminds me of a remarkable case which came under my care in Palestine about 11 years ago. Cases of leech in the naso-pharynx and in the region of the vocal cords are by no means uncommon in the Near East. Not infrequently I have been called upon to remove the parasite from just below the vocal cords, the ease with which this little operation was performed depending greatly on the intelligence of the patient.

The case to which I particularly wish to refer was that of a girl, aged about 12. She came up with the usual symptoms of irritating cough, accompanied by hæmoptysis. The condition had lasted some weeks, so that the child was somewhat exhausted and anæmic; there was also marked breathlessness. On examining the chest the bases of the lungs, as high as the middle of the scapulæ, were found to be absolutely dull and showing the usual signs of consolidation. With the aid of the laryngoscope I had no difficulty in locating the leech, which was situated well below the cricoid cartilage. After several vain attempts to remove the "living foreign body" with laryngeal forceps, I decided that the only hope of saving the child was by means of tracheotomy. Here, however, I was met by a difficulty—viz., a general anæsthetic was quite out of the question, owing to the condition of the lungs. I decided, therefore, to operate under local anæsthesia. Fortunately, the girl was exceptionally intelligent, so that I was able to explain the absolute necessity of what I proposed to do.

I used a solution of cocaine and adrenalin and the operation—the usual "high" one—was soon completed. On opening the trachea, the tail of the leech presented, waving about in an agitated manner—the creature was evidently astonished at being approached from so unusual a direction. It was quickly seized and extracted and proved to be about 2½ inches long. The little patient remained in a critical condition for some days, but ultimately made an excellent recovery. She continued to cough up blood or a rusty expectoration for over a fortnight, during which time the lung consolidation gradually cleared up.

This case is certainly unique in my experience. The successful issue was undoubtedly due in no small measure to the remarkable intelligence and docility of the patient, who seemed to realise that her life depended on her complete submission.—I am, Sir, yours faithfully,

WALTER H. ANDERSON.

Lower Bebington, Cheshire, Nov. 7th, 1919.

THE CONTROL OF VENEREAL DISEASES.

To the Editor of THE LANCET.

SIR,—Mr. H. W. Bayly's letter in your last issue is important, as it brings matters to a climax in the open. With regard to the first part, dealing with Colonel L. W. Harrison's opinions and figures, I have nothing to say; that gentleman is quite able to explain his change of opinion and defend his statistics should he choose to do so. As to the second part, he makes it abundantly clear that I was quite wrong when I suggested that there was really very little difference between the policy of the National Council for Combating Venereal Diseases and that of his committee. In stating this I relied on the published statement signed by the members of that committee that they were not pledged to the idea of packets. Mr. Bayly, as secretary, writing for his committee, states the opposite. In this case the two policies are indeed as widely separated as the poles.

I am, Sir, yours faithfully,

E. B. TURNER,

Chairman, Medical Committee, National Council for Combating Venereal Diseases.

81, Avenue-chambers, Southampton-row, London, W.C., Nov. 11th, 1919.

A DISCLAIMER.

To the Editor of THE LANCET.

SIR,—Will you kindly allow me to say that I am in no way related to the Dr. Pring whose name has recently appeared in connexion with certain proceedings in the Divorce Court.

I am, Sir, yours faithfully,

C. H. PRING.

Ivor House, Trafalgar-road, Camberwell, Nov. 10th, 1919.

Parliamentary Intelligence.

HOUSE OF COMMONS.

TUESDAY, NOV. 4TH.

Pay of Nurses in Mesopotamia.

Colonel YATE asked the Financial Secretary to the War Office whether he was aware that, owing to the rise in the exchange, the members of military nursing services in Mesopotamia were now being mulcted of a large portion of their pay, so much so that sisters of the Imperial Military Nursing Service were now only receiving 154 rupees instead of 231 rupees, and staff nurses only 137 rupees instead of 206 rupees per mensem; and considering that the local cost of living was just as high as before, would he direct that the nursing staff were to be paid at the fixed rate of 1*s.* 4*d.* to the rupee, the same as the non-commissioned officers and men.—Mr. FORSTER replied in a written answer: My honourable and gallant friend is misinformed. Instructions were issued some time ago that the nursing service in Mesopotamia should receive, at the 1*s.* 4*d.* rupee, 10 per cent. of their pay with the whole of their board, washing, and field allowance, as from April 1st, 1919. This amount is ample to cover their necessary expenditure in Mesopotamia.

Pensions Appeal Tribunals.

Mr. MOSLEY asked the Minister of Pensions whether he could state the date of the appointment of the officials in the Tribunals Department of the Ministry; and what duties they had performed since that date.—Sir J. CRAIG (Parliamentary Secretary to the Ministry of Pensions) replied in a written answer: Appointments to the tribunals have been made at various dates to meet the continuous expansion of this work. The first Pensions Appeal Tribunal was constituted in July, 1917. Additional tribunals have been set up from time to time, the total number at Oct. 31st, 1919, being 15. The President of the tribunals has the assistance of a secretary and a small clerical staff. Each tribunal consists of a vice-president and a naval and military member, an official acting as medical assessor, secretary, and clerical assistant to the secretary, who have performed their respective duties since the dates of their appointment. The tribunals have heard and given final decision in nearly 15,000 cases.

Treatment of Syphilis.

Mr. R. YOUNG asked the Minister of Health whether, in view of the fact that treatment for syphilis by means of arsenical drugs approved by his department was now virtually compulsory, he would recommend compensation being given to the dependents in cases where a fatal result might reasonably be attributed to the treatment; and, if not, whether he would consider the desirability of repealing the provisions of the Venereal Diseases Act, 1917, which penalised the treatment of these diseases by others than registered practitioners.—Dr. ADDISON replied in a written answer: There is no such compulsion as is stated in the first part of the question; the remainder of the question, therefore, does not arise.

Export of Morphia.

Sir J. AGG-GARDNER asked the Under Secretary for Foreign Affairs whether H.M. Government accepted licences issued by the Japanese authorities at Dairen and the Kwangtung leased territory as sanctioning the export of morphia thence from Great Britain; whether such morphia was restricted in its use to medical purposes only; what amount of morphia manufactured in Great Britain had been exported to Japan under licence during the past two years; and whether in determining the amount of such exportation for medical purposes the amount of morphia transmitted by post was taken into consideration.—Mr BRIDGEMAN (Parliamentary Secretary to the Board of Trade) replied in a written answer: Under an arrangement made in 1917 a licence for the exportation of morphia to Japan or to the Kwangtung leased territory, whether by parcel post or otherwise, is granted only on the production of a certificate from the competent Japanese authorities to the effect that the parcel in question will be used for medical purposes only. No licences for export to the Kwangtung leased territory have been issued under this arrangement. The total quantity of morphia licensed for export to Japan in 1918 was 36,480 oz., and during the first eight months of the present year 5026 oz. It is not possible to state how much of the quantity licensed was actually exported during the period in question, as no figures are available with regard to the quantity of morphia exported by post.

WEDNESDAY, NOV. 5TH.

Leave for Indian Nurses.

Colonel YATE asked the Secretary for India whether the bonus granted by Army Order 300 of August 18th, 1919, to members of Queen Alexandra Imperial Nursing Service and other nurses on British rates of pay had been extended to the Queen Alexandra Military Nursing Service for India and other ladies nursing in Indian military hospitals on rupee rates of pay; and whether a sufficient number of temporary nurses had been recruited in service in India to permit of the relief of those regulars of the Indian Nursing Service who had been working in India and Mesopotamia continuously throughout the war, and owing to military requirements had been unable to obtain their long overdue furlough, and had lately been told that no hope could be held out that they could have furlough in the near future.—Mr. MONTAGU replied: The answer to the first part of my honourable and gallant friend's question is in the affirmative. The recent appointment of some 250 temporary nurses should be sufficient to enable the Indian Government to give relief to the permanent staff in the matter of leave.

Wounded Officers under Treatment.

Mr. ALFRED SHORT asked the Secretary for War whether he was aware that wounded officers still receiving treatment at the officers' hospital, Headington, Oxford, had been discharged from the army and were now in receipt of pension only, whilst others had been under hospital treatment for considerable periods and were still in receipt of full army pay; and whether he would have inquiry made into this matter, and direct that the officers in the above-mentioned hospital should receive the same treatment as all other wounded officers and men.—Mr. FORSTER replied: It is quite possible without any breach of regulations that an officer may be in an army hospital after he has been retired from the army, and I have no reason to suppose that the officers at Headington have been irregularly treated; but if my honourable friend will give me particulars of the cases he has in mind I will have inquiry made.

Qualifications of Dentists.

Mr. GODFREY LOCKER-LAMPSON asked the Prime Minister whether it was intended to introduce a Bill to give effect to the report of the committee appointed to inquire into the extent and gravity of the evils of dental practice by persons not qualified under the Dentists Act.—Sir TUDOR WALTERS (Paymaster General) replied: Yes, Sir; but the issues involved are complex and numerous, and must be considered in relation to other necessary elements in the development of health services for the community, so that I cannot yet make any statement as to the precise lines on which such legislation will be proposed.

Training Centres for Disabled Men.

Mr. HALLAS asked the Pensions Minister whether he was aware that the use of two hostels situated near the works of the Austin Motor Company, Birmingham, as centres for the curative training and treatment of disabled ex-Service men was preventing their use as lodgings for 1500 men and boys who would be employed at the works named, and was therefore both promoting unemployment and aggravating the housing difficulty; whether he was aware that there were several large void Government hutments in Sutton Park which would, from the point of view of access and surroundings, be more convenient as training centres than the hostels named; and whether, in the light of these facts, he would reconsider his decision.—Sir J. CRAIG replied in a written answer: My right honourable friend has received representations from the Ministry of Labour as to the desire of the Austin Motor Company to obtain the hostels in question. Representations have also been made direct to this Department by the company, and it was only after full consideration of these representations, and consultations with the Ministry of Health as to housing needs, that the decision was taken to utilise the hostels for the purposes of a convalescent centre for the concurrent treatment and training of discharged disabled men. The demand for such facilities is urgent. An alternative proposal to take hutments in Sutton Park for the purpose of a centre has been considered, but this scheme was rejected in favour of the hostel scheme on account of the much greater cost involved in adapting the premises and the delay that would have been occasioned.

THURSDAY, NOV. 6TH.

Disability Awards in Terms of Money.

Captain LOSEBY asked the Pensions Minister if he had yet been able to put into operation the recommendations of the Select Committee on Pensions that soldiers appearing before medical boards should be informed immediately after examination of the degree of disability translated into terms of money at which they had been assessed.—Sir L. WORTHINGTON-EVANS replied: As soon as the Medical Appeal Boards are in operation in the regions the pensioner will be told the degree of disability found by the Board which examines him.

Captain COOTE: Can the right honourable gentleman say when these boards are likely to be established?—Sir L. WORTHINGTON-EVANS: They are very nearly complete. In most regions they are in operation.

The Standardising of Artificial Limbs.

Major COHEN asked the Pensions Minister whether the report of the Bacon Committee, which inquired into the question of the standardising of artificial limbs, had yet been considered; and, if so, whether these recommendations were being adopted.—Sir L. WORTHINGTON-EVANS replied: The answer to the first part of the question is in the affirmative. With regard to the latter part I am adopting the report in its entirety, except that I disagree with the recommendation that in every case the man should have a permanent peg leg in addition to the mechanical limb which is to be provided in duplicate.

Permanent Disability Appeals.

Captain LOSEBY asked the Pensions Minister if he had yet been able to grant the right of appeal on account of pensions permanently assessed and awarded to disabled soldiers; and if he would inform the House of any plan that he had in contemplation in the matter.—Sir L. WORTHINGTON-EVANS replied: Medical appeal boards of the Ministry have now been set up to which all men can appeal who are dissatisfied with the degree at which their disability is assessed. But I cannot make any announcement on the question of granting a statutory right of appeal on assessment in cases of permanent award.

Reduction of Medical Awards.

Captain LOSEBY asked the Pensions Minister if he had yet been able to put into operation the recommendation of the Select Committee on Pensions that pensions awarded by the medical boards to disabled soldiers should not be liable to reduction by any administrative act but only by decision of a further competent board.—Sir L. WORTHINGTON-EVANS: The answer is in the affirmative. As each region is set up arrangements are made to ensure that the findings of the medical boards of the Ministry shall not be amended without the agreement of the board which examined the man or of a board which will re-examine him.

Arrears of Pensions Appeals.

Captain LOSEBY asked the Pensions Minister if he could inform the House to what extent pensions appeal boards were still in arrear with their cases; and what steps were now taken to assist disabled men during the period that the appeal was pending.—Sir L. WORTHINGTON-EVANS: I assume that the honourable and gallant Member refers to the Pensions Appeal Tribunals which have been reconstituted as from Nov. 1st, under the jurisdiction of the Lord Chancellor, in accordance with the provisions of the War Pensions (Administrative Provisions) Act, 1919. A great improvement has recently been made. The cases in hand in May last numbered 16,000, in August the number was reduced to 11 000, and to-day to 6000, including cases in the hands of local committees and those adjourned at the request of the appellant. Local committees are authorised, in cases where the medical referee is of opinion that the appeal should succeed, to make recoverable advances up to the probable rate of pension. I am, however, considering simplifying the preliminary procedure in these appeal cases, and so lessening the period of waiting and making the present extensive provision of recoverable advances unnecessary.

Mr. HOUSTON: Can the right honourable gentleman tell me whether the decision of the Appeal Board is final, or whether, when fresh circumstances are brought to light, it can be reconsidered?—Sir L. WORTHINGTON-EVANS: The decision of the appeal tribunals is final, but it has been my practice, when they were under my control, that if really new evidence was subsequently discovered, to communicate the fact to the president of the tribunal, leaving it to him at his discretion to order a new trial if he thought proper. Otherwise their action is final.

Prisoner Certified Insane.

Lieutenant-Commander KENWORTHY asked the Secretary for the Home Department whether he was aware that Gunner John Brown, No. 1511, formerly of the 36th battery of the Royal Field Artillery, was certified as insane at Wandsworth Prison on Oct. 28th, 1917, and was sent to Berkshire County Asylum, from which he was discharged as sane on Feb. 14th, 1918; whether he was aware that at no time did the medical officer of that asylum regard Gunner Brown as insane; whether he could state by whose orders he was medically examined in October, 1917, and by whom he was certified insane: and whether he could state by whose orders Gunner Brown was detained in Berkshire County Asylum.—Mr. SHORT replied in a written answer: Gunner John Gore Brown was certified insane on Oct. 22nd, 1917, while serving a sentence of 18 months' imprisonment for housebreaking in H.M. Prison, Wandsworth, and was removed to Berkshire County Asylum. The certificate was given by two magistrates, members of the Prison Visiting Committee, and two medical men, and the order for transfer to an asylum was made by my predecessor under the Criminal Lunatics Act, 1884. I have no information as to the opinion formed by the medical officer of the asylum, but Brown, who ceased to be a criminal lunatic on the expiration of his sentence on Nov. 26th, 1917, appears to have been detained as a lunatic for a further period of two and a half months before he could be discharged as sane.

Nurses' Registration.

Dr. ADDISON (Minister of Health) presented the Nurses' Registration (No. 2) Bill "to provide for the registration of nurses." The measure was read a first time, and ordered for second reading on Monday, Nov. 10th.

Medical News.

UNIVERSITY OF GLASGOW.—The following degrees were conferred on Nov. 8th:—

Doctor of Medicine (*M.D.*).—Henry Graeme Anderson (with commendation), Hector Mackay Calder, George Fletcher (with commendation), Crawford Lundie, Donald M'Intyre, Andrew Bruce MacLean, George Macleod (with high commendation), Norman Alexander Macleod, Samuel Johnstone Moore, Berkeley Hope Robertson, and Alfred Cecil Sharp.

ROYAL SOCIETY OF ARTS.—On Wednesday afternoon next, at 4.30, the opening address of the 166th session of the society will be delivered by Sir Henry Trueman Wood, vice-president and chairman of the council. The subject is "Science and Industry."

MEDICO-LEGAL SOCIETY.—A meeting of this society will be held at 11, Chandos-street, Cavendish-square, W., on Thursday, Nov. 27th, at 8.30 P.M., when Dr. R. Henslowe Wellington, the President, will give an inaugural address, after which a paper will be read by Dr. A. P. Gibbons on "Suggested Reforms in the Workmen's Compensation Act."

ABERDEEN UNIVERSITY CLUB, LONDON.—The sixty-second half-yearly dinner of the club will be held at the Criterion Restaurant, Piccadilly-circus, W., on Thursday next, Nov. 20th, at 7.30 P.M., Professor Ashley Watson Mackintosh in the chair. The annual general meeting will be held previous to the dinner at 6.30 P.M. Dr. W. A. Milligan, 11, Upper Brook-street, W.1, is acting as honorary secretary to the function, and the names of intended guests should be intimated to him immediately. The price of dinner tickets, exclusive of wine, is 12*s.* 6*d.*

MEDICO-PSYCHOLOGICAL ASSOCIATION OF GREAT BRITAIN AND IRELAND.—The next quarterly meeting of this association will take place on Tuesday, Nov. 25th, at 11, Chandos-street, Cavendish-square, London, W., under the presidency of Dr. Bedford Pierce, at 2.45 P.M. Dr. Charles Hubert Bond, Commissioner of the Board of Control, will read a paper entitled, "The Need for Schools of Psychiatry," and Major W. S. J. Shaw, superintendent, North Veravoia, Poona, India, will read a paper entitled, "The Treatment and Administration of Mental Diseases in India."

THE CHILDREN'S JEWEL FUND.—This fund, initiated on Jan. 1st, 1918, with the object of providing financial support for the establishment of welfare centres for ante-natal and post-natal care, as well as day nurseries for children whose mothers are compelled to earn their living, has now allocated £22,273 18*s.* in 126 grants for the establishment of new centres or for the development of new work in connexion with existing centres, such as dental clinics, ante-natal clinics, observation wards for ailing babies, massage clinics, &c. Only 50 applications have been refused in accordance with certain definite conditions defined by the committee. Now that the importance of welfare work is generally recognised, and local authorities are being urged to establish municipal centres and to develop child-welfare work in its various branches, the administrative committee of the Children's Jewel Fund has decided to concentrate its efforts in a permanent memorial, and to establish a large model centre for ante-natal and post-natal care in a suitable London district. This centre will be known as the Children's Jewel Fund Centre, and it is hoped that all who have supported the appeal during the war will give their interest and help to this particular centre, which is designed to be a model of its kind. After providing for contingent expenses in connexion with this proposal, there will still be a small balance to be allocated for other centres, if they apply before Dec. 1st. The committee desires to make it known that all such applications should be sent in by that date, after which no further applications will be entertained, and the fund, in so far as the general grants are concerned, will be closed.

A post-graduate course will be held at the Victoria Hospital for Children, Tite-street, Chelsea, London, S.W., by members of the staff during the fortnight, Nov. 24th to Dec. 5th. Details are given in our advertisement columns.

THE old students' dinner of the London Hospital Medical College, postponed on account of the railway strike, has now been cancelled.

Dr. William Arthur Valentine, of Appledore, Devon, has had the Order of the Redeemer Chevalier conferred upon him by His Majesty the King of the Hellenes.

THE Committee of the Cossham Memorial Hospital, Kingswood, Bristol, has decided to set apart 40 beds for medical and surgical cases of war pensioners.

ST. THOMAS'S HOSPITAL.—The University entrance scholarship for 1919–20, of the value of £50, has been awarded to Mr. G. D. C. Tracey, of Emmanuel College, Cambridge.

A CORNISH CENTENARIAN.—Mr. Robert Lanyon, of Trewolla Farm, Gerran, celebrated the anniversary of his 100th birthday on Nov. 2nd.

Mr. Cairns Forsyth, surgeon to the French Hospital, London, has been awarded the Cross of Chevalier of the Legion of Honour for services rendered to France as médecin chef of a mobile English hospital attached to the Armies of the Argonne and Verdun during the war.

THE MANOR HOUSE HOSPITAL.—This institution, which is under the ægis of the Industrial Orthopædic Society (lately the Allied Hospitals Benevolent Society) has laid down a hospital "constitution" under which the medical staff have been enjoined to act. Owing to the terms of this "constitution" the following members of the medical staff have resigned: Mr. B. Whitchurch Howell, Dr. Stanley Melville, Mr. G. Murray Levick, Surgeon-Commander, R.N., and Mr. W. P. Tindal-Atkinson.

DEATH OF DR. W. BANKS.—William Banks, M.B. Lond., M.R.C.S., of Falmouth, died suddenly on Nov. 4th whilst on his way to visit a patient. He had met with a severe carriage accident about ten years ago and this impaired his health. He was in his sixty-fifth year, had practised in Falmouth since 1885, and was honorary surgeon to the Falmouth Hospital and to the Royal Cornwall Sailors' Home. Dr. Banks took a great interest in municipal matters, and was Mayor of Falmouth for three years. In 1903 he was entertained to a public banquet in recognition of his services to the town. He will be greatly missed in Falmouth, where he was held in the highest esteem, and much sympathy is there felt for his widow and two sons.

NEW MEDICAL OFFICER OF HEALTH FOR GLOUCESTER.—At a meeting of the Gloucester City Council held recently Dr. J. R. Bibby was unanimously appointed medical officer of health for the city, the post having been rendered vacant by the death of Mr. W. M. Hope. Dr. Bibby has been a member of the city council for 13 years and as chairman of the Health Committee for 12 years, as a member of the Insurance Committee and Joint Committee for the treatment of tuberculosis and mental defectives, as well as chairman of the Panel and Local Medical Committee, he has had a wide and practical experience in public health matters. He has seen some four and a half years of active service with the Royal Army Medical Corps, where he attained the rank of lieutenant-colonel. A pleasing feature of his appointment as medical officer was the unanimity of opinion which prevailed in the council that he was the right man for the post.

DONATIONS AND BEQUESTS.—By the will of the late Mr. James Morton the testator has bequeathed, on the death of his wife, £5000 each to Dr. Barnardo's Homes and Sir John Kirk's Mission, John-street, London, W.C., £1000 each to the Belgrave Hospital for Children, Clapham-road, the Victoria Hospital for Children, Chelsea, the Queen's Hospital for Children, Hackney-road, the Hospital for Sick Children, Great Ormond-street, W.C., the National Orthopædic Hospital, Great Portland-street, 12 other hospitals in London, the Society for the Prevention of Cruelty to Children, the National Refuges for Homeless and Destitute Children. Other charities also benefit considerably under the will.—The executors of the will of Mr. Thomas George Langham have given £20,000 to the Leicester Royal Infirmary with a view to perpetuating Mr. Langham's name and memory. The executors suggest that the money should be employed in the building of an orthopædic in-patients' department and an isolation hospital.—The late Miss Elizabeth Richardson, of Heywood, Lancashire, has bequeathed by will £1000 each to the Manchester Royal Infirmary, Dispensary, and Lunatic Asylum; £500 to the Bury Infirmary; and £100 to Henshaw's Blind Asylum, Manchester.

The Services.

ROYAL NAVAL MEDICAL SERVICE.

Surg.-Cmdr. A. G. Eastment to be placed on Retired List at own request.

Surg.-Cmdr. M. J. Smith placed on the Retired List with rank of Surgeon-Captain.

R. J. Inman to be Surgeon-Lieutenant.

ARMY MEDICAL SERVICE.

Col. W. W. O. Beveridge to be Director of Hygiene at the War Office, and to be temporary Brigadier-General whilst so employed.

Temp. Col. A. G. Phear relinquishes his commission, and retains the rank of Colonel.

ROYAL ARMY MEDICAL COLLEGE.

Lieut.-Col. P. S. Lelean, R.A.M.C., to be a Professor.

ROYAL ARMY MEDICAL CORPS.

Temp. Col. H. Burrows (Capt., R.A.M.C., T.F.) relinquishes his temporary commission on re-posting.

Lieut.-Col. J. E. Brogden (half-pay list) retires on retired pay on account of ill-health.

Lieut.-Col. W. H. Wilson Elliot, retired Indian Medical Service, to be temporary Lieutenant-Colonel.

Lieut.-Col. and Bt. Col. G. J. A. Ormsby relinquishes the acting rank of Colonel.

The undermentioned Lieutenant-Colonels relinquish the temporary rank of Colonel: J. H. Campbell, A. W. N. Bowen, L. Humphry (Bt. Col.), H. S. Roch, B. F. Wingate, B. B. Burke, J. Powell (Bt. Col.), D. O. Hyde.

Lieutenant-Colonels relinquishing the acting rank of Colonel: H. Hewetson, C. J. O'Gorman, G. M. Goldsmith, W. R. Blackwell (Bt. Col.), A. E. Hamerton, W. R. P. Goodwin (Bt. Col.), W. L. Steele, H. R. Bateman.

Major and Bt. Lieut.-Col. E. Ryan relinquishes the temporary rank of Lieutenant-Colonel.

Temporary Captains (acting Majors) to be acting Lieutenant-Colonels whilst specially employed: F. R. Fraser, F. D. Saner.

Capt. F. J. Stuart to be Major.

Temp. Major E. B. Pooley, T.D. (Major, 4th R. Lan. R., T.F.) relinquishes his temporary commission on re-posting.

The undermentioned relinquish the acting rank of Major: Capt. W. B. Allen, V.C., Temp. Capts. J. B. Lester (on ceasing to be specially employed), R. Charles, G. Richardson.

Temp. Capt. B. Malaher to be Captain.

E. P. Peake, late Captain, Can. A.M.C., to be temporary Captain.

Capt. A. L. Foster to be acting Major whilst specially employed.

Capt. K. P. MacKenzie is seconded for service with the Egyptian Army.

Capt. H. W. Browne, from T.F., to be Captain.

Lieutenants (temporary Captains) to be Captains: W. H. Ferguson, J. A. Crawford, P. R. O'R. Phillips.

J. F. Cooper (late temporary Honorary Captain) to be Honorary Captain.

Temp. Capt. T. S. Law to be Lieutenant and to be temporary Captain.

Capt. D. C. Bowie (from Special Reserve) to be Lieutenant and to be temporary Captain.

J. A. A. P. Scott to be temporary Lieutenant.

Officers relinquishing their commissions: Temporary Lieutenant-Colonels retaining the rank of Lieutenant-Colonel: S. L. Jones, H. G. Ashwell, J. V. Blachford; Temp. Majors (Bt. Lieut.-Col.) S. Fleming (retains the Brevet rank of Lieutenant-Colonel), A. E. Morrison (retains the rank of Major), J. R. P. Phillips (retains the rank of Major); Temp. Capt. (acting Lieut.-Col.) C. J. West (granted the rank of Lieutenant-Colonel); Temporary Captains granted the rank of Major: D. M. Hunter, A. Fullerton, D. J. Glen, (Acting Major) J. Taylor, W. S. S. Berry, R. Semple; Temp. Capts. (retaining the rank of Captain) H. Appleton, F. J. A. Keane, J. A. Quin, C. R. Edwards, H. A. de Morgan, J. B. McFarland, J. D. Robertson, D. McDougall, C. J. Marshall, P. D. Scott, J. M. Forsyth, P. W. Maclagan, N. S. Neill, P. Rose, J. A. O'Dea, A. W. Frew, S. Littlewood, J. Lyons, G. Pirie, D. W. Ritchie, W. Hughes, N. M. Boyce, R. K. G. Graves, S. Melville, A. C. Dickson, B. Wood-White, J. Stevenson; Temp. Hon. Capts. (retaining the honorary rank of Captain) J. F. Harvey, J. L. Dickie; Temp. Lieut. O. K. Lang (retains the rank of Lieutenant); Temp. Hon. Lieut. S. J. Cattley (retains the honorary rank of Lieutenant).

TERRITORIAL FORCE.

Lieut.-Col. (Bt. Col.) G. S. Woodhead, Sanitary Service, relinquishes his commission on account of ill-health and retains his rank.

Lieut.-Col. H. Jones relinquishes his commission on account of ill-health and retains the rank of Lieutenant-Colonel.

Captains (acting Majors) relinquishing the acting rank of Major on ceasing to be specially employed: A. K. Maclachlan, J. Muir, G. E. Martin, G. L. Findlay, R. M. Vick.

1st London Sanitary Company: Lieut. W. G. Gibbs to be Captain.

ROYAL AIR FORCE.

Medical Branch.—Flight Lieutenants to be Squadron Leaders: W. A. S. Duck, A. E. Panter, A. R. Sharrod.

The undermentioned are transferred to the unemployed list: Capts. W. B. Loveless, L. B. Stringer, R. J. Hearn, J. I. Russell, C. Peacock; 2nd Lieut. L. W. Jones.

Dental Branch.—2nd Lieut. (acting Capt.) G. W. Allen to be 2nd Lieut. (from T.) and retains his acting rank whilst so employed.

INDIAN MEDICAL SERVICE.

Captains to be Majors: W. G. R. Williams, Sorabji Jamasji Bhathena.

Appointments.

Successful applicants for vacancies, Secretaries of Public Institutions, and others possessing information suitable for this column, are invited to forward to THE LANCET *Office, directed to the Sub-Editor, not later than 9 o'clock on the Thursday morning of each week, such information for gratuitous publication.*

ACHESON, D. R., M.B., has been appointed District Medical Officer by the Thornbury Board of Guardians.

BEAUMONT, G. E., D.M. Oxon., M.R.C.P., D.P.H., Assistant Physician, Hospital for Consumption and Diseases of the Chest, Brompton.

BIBBY, James Richard, M.B., C.M. Edin., Medical Officer of Health for Gloucester.

HARDYMAN, G., M.B., F.R.C.S. Edin., Honorary Consulting Surgeon to the Royal Mineral Water Hospital, Bath.

HUGO, H. F. L., M.C., M.B., B.S. Lond., Medical Officer of the Cheriton Bishop District, by the Crediton (Devon) Board of Guardians.

LANGRAM, W., L.R.C.P., L.M. Edin., L.R.C.S. & L.A.H. Irel., Medical Officer for the Dalwood and Stockland District, by the Honiton (Devon) Board of Guardians.

PHILLIPS, H. R., M.D. Edin., Anæsthetist, Hospital for Sick Children, Great Ormond-street.

ROPER, A. C., F.R.C.S., L.R.C.P. Edin., M.R.C.S., Honorary Consulting Surgeon and Honorary Governor to the West of England Eye Infirmary, Exeter.

SHIRVELL, E. A., L.R.C.P., M.R.C.S., Medical Officer of Health for Padstow (Cornwall).

Certifying Surgeons under the Factory and Workshop Acts: AVELING, L. B., M.R.C.S., L.R.C.P. Lond. (Royton); MURRAY, P., M.D. Edin. (Leven); ANDERSON, R., M.D. Glasg. (Erdington); WIDDAS, H., M.B., B.S. Durh. (Shildon).

Vacancies.

For further information refer to the advertisement columns.

Antrim County Council.—Asst. Tuberc. M.O. £400.
Bath, Royal United Hospital.—H.S. £150.
Bermondsey Infirmary, Lower-road, Rotherhithe, S.E.—First and Second Asst. M.O.'s. £350 and £300.
Birmingham and Midland Eye Hospital, Church-street, Birmingham.—Asst. S. £100.
Blackburn and East Lancashire Royal Infirmary.—Junior H.S. £250.
Blackburn Union.—Res. M.O. £400.
Bradford Children's Hospital.—H.S. £180.
Brighton, County Borough.—Asst. M.O. £450.
Bristol Royal Infirmary.—Clin. Pathologist. £500.
Burton-on-Trent Infirmary.—H.S. £200.
Cardiff, Glamorgan County Council.—County M.O. £1000.
Cardiff, University College of South Wales and Monmouthshire.—Lect. in Physiol. Chem. and Asst. Lect. and Demon. in Physiol. £250.
Carlisle, Cumberland County Council.—Three Asst. County M.O.'s. £450.
Central London Ophthalmic Hospital, Judd-street, W.C.—Asst. S.
Chester, Cheshire County Council.—Dist. Tuberc. O. £450.
Chester City and County.—Asst. M.O.H. £400.
Chester Royal Infirmary.—H.P. £150.
City of London Union Institution and Infirmary, 44, Clifden-road, Clapton, E.—Asst. M.O. £250.
Croydon Mental Hospital, Upper Warlingham, Surrey.—Sec. Asst. M.O. £500.
Dorchester, Dorset County Council.—Asst. County M.O. £400.
Dudley County Borough Education Committee.—Asst. School M.O. and M.O.H. £500.
Dumfries, Crichton Royal.—Asst. P. £350.
Durham County Council.—Female Asst. Sch. M.O. £600. Senior Dent. O. £600.
Eastbourne, Princess Alice Hospital.—Res. M.O. £175.
Elizabeth Garrett Anderson Hospital, Euston-road, N.W.—Female H.P., Obstet. Asst., and Two H.S.'s. £50. Pathologist and Asst. Path. £235 and £100. Hon. Anæs. £10 10s. Hon. Asst. Obstet.
Evelina Hospital for Children, Southwark, S.E.—H.P. £160.
Gloucester County Asylums.—Jun. Asst. M.O. £300.
Gloucestershire Royal Infirmary and Eye Institution.—Asst. S.
Great Northern Central Hospital, Holloway, N.—Res. M.O.
Grosvenor Hospital for Women, Vincent-square, Westminster, S.W.—Asst. Gynæc.
Halifax Royal Infirmary.—H.S.
Hereford County and City Mental Hospital.—Sen. Asst. M.O. £400.
Holborn Union Infirmary, Archway-road, N.—First and Second Asst. M.O.'s. £300 and £250.
Hospital for Consumption and Diseases of the Chest, Brompton, S.W.—Anæsthetist.
Huddersfield Royal Infirmary.—Sen. H.S. and Asst. S. £200 and £150 respectively.
Johannesburg, South African School of Mines and Technology.—Prof. of Veterinary Anat. £800.
Lightburn Joint Hospital, Shettleston, near Glasgow.—Res. Phys. Supt. £350.
Liverpool Eye and Ear Infirmary, Myrtle-street.—Hon. Asst. S. and Hon. Path.
London County Council.—Fifth Asst. M.O.'s for London County Mental Hospitals £300.
Manchester Royal Eye Hospital.—Jun. H.S. £120.
Manchester Royal Infirmary.—H.S.'s. £25 and £50.
Mesopotamia, Civil Medical Service.—Lady Doctors, Civil S.'s, Ophthal. S., Path., Dental S., M.O.H., and Director Central Laboratory. Rs. 650/- to Rs. 1800/- a month.
Miller General Hospital for South-East London, Greenwich-road, London, S.E.—Res. M.O. and Hon. Anæs.
Ministry of Pensions, London Region.—Med. Referees.
Newcastle-on-Tyne, Royal Victoria Infirmary.—Hon. Asst. S.
Northallerton, North Riding of Yorkshire County Council Education Committee.—Asst. Sch. M.O.'s £500.
Northampton, Northamptonshire County Council Education Committee.—School Dentist. £400.
Norwich, Norfolk and Norwich Hospital.—H.S. and Cas. O. £200.
Nottingham General Hospital.—H.S. £150.
Paddington Green Children's Hospital, London, W.—Radiographer.
Preston, High Carley Sanatorium, near Ulverston.—Asst. Tuberc. M.O. £400.
Preston, Lancs, County Asylum, Whittingham.—Locum Tenens. £7 7s. per week.
Public Dispensary, 122, Drury-lane, W.C.—Res. M.O. £105.
Queen's Hospital for Children, Hackney-road, Bethnal Green, E.—Asst. P.
Reading, Berkshire Education Committee.—Asst. Sch. Med. Insp. £400.
Rhondda Urban District Council.—Asst. Sch. M.O. and M.O.H. £500.
Rochdale Infirmary and Dispensary.—Junior H.S. £125.
Royal College of Surgeons of England.—Election to Court of Examiners.
Royal Eye Hospital, St. George's Circus, Southwark, S.E.—Jun. H.S., 50 gns.; and Clin. Asssts.
Royal Free Hospital and London School of Medicine for Women.—Pathologist and Direct. of Path. Studies. £700.
Royal Waterloo Hospital for Children and Women, S.E.—Hon. P.
St. Bartholomew's Hospital.—Rose Research Fellowship. £600.
St. George's Hospital, S.W.—Res. Anæs. £100.
St. Marylebone Infirmary.—Con. P., S., Gynæc., Oph. S., Neurol., Dermat., Bact. and Advising Sanitary O., £105; P. to X Ray Dept., £150; Dent. S., £50.
St. Peter's Hospital for Stone, &c., Henrietta-street, Covent Garden, W.C.—Jun. H.S. £75.
Salford Royal Hospital.—Cas. H.S. £100.
Sheffield Education Committee.—Asst. School M.O. £450.
Sheffield, East-End Branch of the Children's Hospital.—H.S. £150.
Sheffield Royal Hospital.—Res. Asst. Cas. O. £120.
Sheffield Royal Infirmary.—H.S. £150.
Singapore, Straits Settlements, Health Department.—Asst. Health O. $4800–$5400.
Southend-on-Sea County Borough.—Deputy M.O.H. and Asst. Sch. M.O. £500
Southwark Borough.—Female Asst. M.O.H. £400.
University of London.—Chair of Physiology. £800.
Ventnor, Isle of Wight, Royal National Hospital for Consumption and Diseases of the Chest.—Asst. Res. M.O. £200.
Wakefield, West Riding Asylum.—Junior Asst. M.O. £400.
Walsall General Hospital.—Female Jun. H.S. and Anæs. £175.
Wandsworth Union, St. John's Hill, Wandsworth, S.W.—Dist. M.O. £100.
Wells Asylum, Somerset.—Asst. M.O. £300.
West End Hospital for Nervous Diseases, St. Katharine's Lodge, Regent's Park.—H.P. £150.

THE Secretary of State for the Home Department gives notice of a vacancy for a Medical Referee under the Workmen's Compensation Act, 1906, for the Barrow-in-Furness, &c., County Courts, Circuit No. 3. Applications should be addressed to the Private Secretary, Home Office, not later than Nov. 29th. The Home Secretary also gives notice of a vacancy for a Medical Referee under the Workmen's Compensation Act for Ashbourne, Bakewell, Belper and Ilkeston, Derby and Long Eaton, Wirksworth and Matlock, and Burton-on-Trent County Courts, Circuit No. 19. Applications as above not later than Dec. 3rd.

THE Chief Inspector of Factories, Home Office, S.W., gives notice of vacancies for Certifying Surgeons under the Factory and Workshop Acts at Downton, Kingston-on-Thames, Otley, Porthcawl, and Saintfield.

Births, Marriages, and Deaths.

BIRTHS.

ANDERSON.—On Nov. 8th, at Buckingham-terrace, Glasgow, the wife of Dr. J. Mackenzie Anderson, of a daughter.

ENSOR.—On Nov. 10th, at a Nursing Home, the wife of Colonel H. Ensor, C.M.G., D.S.O., R.A.M.C., Hythe, Kent, of a son.

HARDY.—On Nov. 6th, at 43, Beaufort-road, Edgbaston, Birmingham, to Dr. and Mrs. T. L. Hardy—a daughter.

INCH.—On Nov. 4th, in Edinburgh, the wife of Dr. T. Douglas Inch (late Major, R.A.M.C.), of a son.

ROBERTS.—On Nov. 8th, at Shawford, Hants, the wife of G. Marsden Roberts, M.R.C.S., L.R.C.P., of a son.

WARD.—On Nov. 9th, at Enborne Grange, Newbury, the wife of George E. S. Ward, M.D., M.R.C.P., of 16, Queen Anne-street, W. 1., of a daughter.

MARRIAGES.

MAYNARD—TULLY.—On Nov. 5th, at St. Philip's, Kensington, Edwin Maynard, M.D., F.R.C.S., of Oxford-terrace, Hyde Park, W., to Nancy Frances Tully.

DEATHS.

BAIRD.—On Nov. 9th, at his residence, Adelaide, Sandymount Castle, Sandymount, Dublin, George Henderson Baird, M.D., Captain, R.A.M.C.

CAMPBELL.—On Sept. 25th, at Swiss View, Yercand, Madras Presidency, India, George Gunning Campbell, M.R.C.S., L.R.C.P., in his 43rd year.

LEWIS.—On Nov. 9th, at 6, The Crescent, Cromer, Thomas Preston Lewis, M.D., late of Brixton-hill, London, aged 66.

N.B.—A fee of 5s. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Medical Diary for the ensuing Week

SOCIETIES.

ROYAL SOCIETY, Burlington House, London, W.
THURSDAY Nov. 20th Papers:—Mr W. J. Johnston: A Linear Associative Algebra suitable for Electro magnetic Relations and the Theory of Relativity (communicated by Sir Joseph Larmor, M.P.).—Sir Joseph Larmor, M.P Note on Mr W. J. Johnston's Calculus for Generalised Relativity.—Mr. G. E. Bairsto: On the Variation with Frequency of the Conductivity and Dielectric Constant of Dielectrics for High Frequency Oscillations (communicated by Prof. J. A. Fleming).—Mr. F. J. W Whipple: Equal Parallel Cylindrical Conductors in Electrical Problems (communicated by Dr. C. Chree).—Mr. G. A. Schott: The Scattering of X and Y Rays by Rings of Electrons. A Crucial Test of the Electron Ring Theory of Atoms (communicated by Sir Joseph Larmor, M.P.).

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

Tuesday, Nov. 18th.

GENERAL MEETING OF FELLOWS: at 5 P.M.
Ballot for Election to the Fellowship. (Names already circulated.)

MEETINGS OF SECTIONS.

Tuesday, Nov. 18th.

THERAPEUTICS AND PHARMACOLOGY (Hon. Secretaries—Philip Hamill, Douglas Cow): at 4.30 P.M.
Discussion:
On "The Treatment and Management of Diseases due to Deficiencies in Diet," to be opened by Dr. F. G. Hopkins
The following will also take part:—Dr. F. D. Boyd, Dr. Marion Delf, Dr. A. Harden, Miss Hume, Dr. W. H. Willcox, and Dr. S. S. Zilva.

PATHOLOGY (Hon. Secretaries—J. A. Murray, Cecil Price-Jones): at 8.30 P.M.
Laboratory Meeting at the Lister Institute for Preventive Medicine, Chelsea Gardens, S.W. 1.

Wednesday, Nov. 19th.

HISTORY OF MEDICINE (Hon. Secretaries Arnold Chaplin, F. G. Crookshank): at 5 P.M.
Papers:
Dr. Archibald Leitch: Farquhar Leiche, Medicus Regis
Dr. Charles Singer: The Earliest Medical Text by an English Hand.

Thursday, Nov. 20th.

DERMATOLOGY (Hon. Secretary—Henry MacCormac): at 4.30 P.M.
Cases:
Dr Bunch: Case of Linear Morphœa.
Dr. MacLeod: (1) Melanotic Lesion on Sole of Foot; (2) Case for Diagnosis.
Dr. Barber: (1) Case for Diagnosis—Blastomycosis (?); (2) Erythrodermie Congenita e Ichtyo-forme.
Other cases will be shown.

Friday Nov 21st.

OTOLOGY (Hon. Secretaries—H. Buckland Jones, Lionel Colledge): at 5 P.M.
Presidential Address:
Mr. Herbert Tilley: A Plea for the Better Education of the Medical Student in Oto-Rhino-Laryngology
Cases and Specimens will be shown by Dr H. J. Banks-Davis, Mr. Arthur H. Cheatle, Dr. Dan McKenzie, Mr. Mollison, and others at 4.30 P.M.

ELECTRO-THERAPEUTICS (Hon. Secretaries—Walter J. Turrell, Stanley Melville): at 8.30 P.M.
Short Papers with Demonstrations:
Dr. G. B Batten: Apparatus for obtaining Morton Wave Current and Static Modalities from a Coil.
Major G. Cooper, R.A.M.C.: The Artificial Stimulation of Muscle, with Demonstration of a New Form of Faradic Coil.

ROYAL METEOROLOGICAL SOCIETY, 70, Victoria-street, S.W.
WEDNESDAY, Nov 19th.—5 P.M., Paper: Lieut. C. W. B Normand: The Effect of High Temperature, Humidity and Wind on the Human Body.

HARVEIAN SOCIETY OF LONDON, at the Medical Society's Rooms, 11, Chandos-street, Cavendish-square, W.
THURSDAY, Nov. 20th.—8.30 P.M., Address:—Dr. Hill: Prevalent Misconceptions, often Mischievous, concerning the Œsophagus and its Diseases.

SOCIETY OF TROPICAL MEDICINE AND HYGIENE, 11, Chandos-street, Cavendish-square, W.
FRIDAY, Nov. 21st.—8.30 P.M. Paper:—Major E. E. Austen, D.S.O.: Anti-mosquito Measures in Palestine during the Campaigns of 1917 1918.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

NATIONAL HOSPITAL FOR THE PARALYSED AND EPILEPTIC, Queen-square, W.C. 1.
MEDICAL SCHOOL.
MONDAY, Nov. 17th.—2-3.30 P.M., Out-patient Clinic: Dr. Collier. 3.30 P.M., Lecture:—Dr. Farquhar Buzzard: Intracranial Tumours.
TUESDAY, Nov 18th.—2-3.30 P.M. Out-patient Clinic: Dr. Grainger Stewart. 3.30 P.M., Ward Cases: Dr. James Taylor.
WEDNESDAY, Nov 19th.—2 P.M., Lecture:—Mr. Armour: Surgery of the Spinal Cord. 3.30 P.M., Lecture:—Dr. Collier: Cerebellar Ataxia
THURSDAY, Nov 20th.—2-3.30 P.M., Out-patient Clinic: Dr. Farquhar Buzzard. 3.30 P.M., Lecture:—Dr. Farquhar Buzzard: Intracranial Tumours.
FRIDAY, Nov. 21st.—2-3.30 P.M., Out-patient Clinic: Dr. Gordon Holmes. 3.30 P.M., Ward Cases: Dr. Tooth.
Fee for Post-Graduate Course £5 5s. C. M. Hinds Howell, Dean.

MANCHESTER ROYAL INFIRMARY POST-GRADUATE CLINIC.
TUESDAY, Nov. 18th.—Lecture:—Dr. Clegg: Glaucoma.

ROYAL INSTITUTE OF PUBLIC HEALTH, in the Lecture Hall of the Institute, 37, Russell-square, W.C.
Course of Lectures on Housing Problems and Town Planning in Relation to Public Health.
WEDNESDAY, Nov 19th.—4 P.M., Lecture IV.:—Mrs. S. A. Barnett, C.B.E.: Public and Individual Housing Ideals.
Course of Instruction for Candidates as Tuberculosis Officers. General Practitioners and others. Bacteriological Demonstrations will be given in the Laboratories of the Institute, and visits arranged to Sanatoriums, Tuberculosis Dispensaries &c.
THURSDAY, Nov. 20th.—5 P.M., Lecture VII.:—Mr. P. C. Varrier-Jones: Tuberculosis Colonies and their Management.

HOSPITAL FOR CONSUMPTION AND DISEASES OF THE CHEST, Brompton, S.W.
WEDNESDAY, Nov. 19th.—4.30 P.M., Lecture:—Dr. Jex-Blake: Bronchiectasis.

NATIONAL HOSPITAL FOR DISEASES OF THE HEART POST-GRADUATE COURSE, Westmoreland-street, W.
MONDAY, Nov. 17th.—11 A.M., Out Patients: Dr. Goodall. 2 P.M., In-patients: Dr. Moon.
TUESDAY.—2 P.M., Out-Patients: Dr. R. Wells. 2.30 P.M., In-patients: Dr. Gibbes.
WEDNESDAY.—2 P.M., Out-patients: Dr. Moon. 5.30 P.M., Lecture:—Dr. Price: Auricular Flutter and Paroxysmal Tachycardia.
THURSDAY. 10 A.M., In patients: Dr. Hamill. 2 P.M., Out-patients: Dr. Price.
FRIDAY.—2 P.M., Out patients: Dr. Gibbes. 2 30 P.M., In-patients: Dr Wells.
SATURDAY.—10 A.M., Out-patients: Dr Hamill.

ST. JOHN'S HOSPITAL FOR DISEASES OF THE SKIN, 49, Leicester-square, W.C.
THURSDAY, Nov 20th.—5 P.M., Chesterfield Lecture:—Dr. M. D Cr-rell: The Diagnosis and Treatment of the Late Eruptions of Syphilis.

BOOKS, ETC., RECEIVED.

ALLEN, GEORGE, AND UNWIN London.
Defective Housing and the Growth of Children. By J. L. Dick, M.D Pp. 94.

EVELEIGH NASH COMPANY, London.
Hearts of Women. By Morley Roberts. Pp. 269. 7s.

FROWDE, H., AND HODDER AND STOUGHTON, London.
A Manual of Physics. By J. A. Crowther, Sc.D. Pp. 537. 16s

HEFFER W., AND SONS, Cambridge.
Way of Healing. By Estelle Blyth. Pp. 136.

HEINEMANN, WILLIAM, London.
Anæsthesia in Dental Surgery. By T. D. Luke, M.D., and J. S. Ross, M.B. 4th ed. Pp. 255. 8s 6d.

INSTITUT D'ESTUDIS CATALANS, Barcelona.
Treballs de la Societat de Biologia. 1918. Edited by A. Pi Suner. Pp. 352.

SOCIETY FOR PROMOTING CHRISTIAN KNOWLEDGE, London.
A Corner Stone of Reconstruction. A Book on Working for Social Purity among Men. By Four Chaplains to the Forces. Pp. 156. 3s 6d.

UNIVERSITY OF CHICAGO PRESS.
Everyday Greek. By Prof. H. A. Hoffman. Pp. 105. $1.25.

URBAN UND SCHWARZENBERG, Berlin und Wien.
Kompendium der topischen Gehirn- und Rückenmarksdiagnostik. Kurzgefasste Anleitung zur klinischen Lokalisation der Erkrankungen und Verletzungen der Nervenzentren. Von Robert Bing, a.o. Professor an der Universität Basel. Vierte, neu durchgesehene Auflage. M 16; geb. M 20
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YEAR BOOK PUBLISHERS, Chicago.
Practical Medicine Series. 1919. Vol. II.: General Surgery. Edited by A. J. Ochsner, M.D. Pp. 624.

Communications, Letters, &c., to the Editor have been received from—

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Communications relating to editorial business should be addressed exclusively to the Editor of THE LANCET, 423, Strand, London, W.C. 2.

Notes, Short Comments, and Answers to Correspondents.

PUBLIC HEALTH AND HOSPITAL WORK IN INDIA IN 1918.

THE large amount of self-government now possessed by the native population of India, especially in the towns and cities, gives interest to the reports of local authorities on the state of the public health and on the sanitary progress that is being made at the present time. The manner in which local affairs are managed may give an indication of the measure of success likely to be attained subsequently in wider fields of administration. It must, of course, always be borne in mind that "India" is not one country, but a subcontinent, and that the region so designated has no unity of race, language, religion, customs, or climate, though it is governed by one central authority.

Bihar and Orissa.

In the report on the working of municipalities in Bihar and Orissa (1917–18), the Lieutenant-Governor, referring to conservancy matters, "notices with pleasure the greater activity in this important branch of administration which was displayed by many of the municipalities in the province." In Patna, however, the capital, the local government gave liberal assistance, but the refusal of the Commissioners to raise sufficient taxation to provide for the recurring costs threatens to render the scheme nugatory. Municipalities also "show very little enthusiasm in watching and controlling the details of work which contribute to the good or ill success of the administration." In Patna district, however, where plague was more widely spread and more virulent than in the previous year, and where cholera also was prevalent, "especially prompt and efficient measures" were taken to check the spread of the epidemic.

Assam.

Assam is the only province that records a higher birth-rate (34·98 per 1000) than that of the previous year (31·35), and of the quinquennium, 1912–16 (32·46), thus indicating an unusually prosperous condition of the public health before the pandemic of influenza. The total death-rate was 46·10, largely exceeding that of the preceding year (27·09), and that of the quinquennium, 1912–16 (27·36). The increased mortality is considered to have been due to influenza, to which 106,452 deaths are attributed (17·04 per 1000); these mostly occurred in the latter part of the year, there having been two invasions, the first a mild one in July and August, the second, of great virulency, in October, November, and December; in one village a mortality of nearly 60 per cent. of the inhabitants resulted from this cause. The tea-garden population suffered severely. The mortality from influenza was about 33 per 1000, chiefly among those of the most active age-groups. Epistaxis was common, and an abdominal type of affection with intractable diarrhœa, resembling cholera. All known methods of prevention and treatment were tried. Segregation of cases, which could be carried out in jails, was of great service, and a "mixed catarrhal vaccine," prepared by Captain R. Knowles, I.M.S., director of the Shillong Pasteur Institute, with the object of immunising against pulmonary complications, was largely used with some measure of success. Captain Knowles devoted the whole of the resources of the Shillong Pasteur Institute to the preparation of this "pneumococcus—influenza—polyvalent" vaccine (P.I.P.), for which demands come from other provinces of India as well as Assam, and was able by strenuous exertions to supply nearly a quarter of a million doses. It is still too early to come to a conclusion as to the value of the vaccine; "the general tenour of the reports goes to show that, when given in a full dose, it produces a temporary, but definite, immunity to pneumonia, septic bronchitis, &c., and that it does what it was hoped it would accomplish—renders influenza in the inoculated an unimportant disease free from complications." The institute also provided 1091 patients with antirabic treatment, of whom 1068 underwent the complete course. Thirteen deaths occurred from hydrophobia, but six only of these cases died later than 15 days after completion of treatment—i.e., there were only six failures out of 1068 cases, or 0·56 per cent. Captain Knowles alludes to the fact that, of these 1068 persons treated less than half (467) came from Assam, the remainder (601) coming from Bengal and (in 14 instances) from Bihar and Orissa. With regard to influenza, Major T. McCombie Young, Sanitary Commissioner, makes the following recommendations as to future action: (1) the prohibition of public gatherings, closure of schools and places of entertainment, and the wearing of masks under certain conditions; (2) to avoid sneezing and coughing in public; (3) vaccine inoculation; (4) efficient organisation to utilise all available resources effectually and speedily when an outbreak is threatened.

Cholera was prevalent in Cachar (3·44 deaths per 1000) and Sylhet (3·67) towards the end of the year; some of these deaths, however, were probably due to gastro-intestinal influenza. There was also a great increase in deaths from "fevers," 26·25 per 1000, compared with 14·91 in 1908–1917. Many of these deaths may have been due to influenza. The anti-malarial operations on the Assam-Bengal Railway at Lunding were considerably interfered with by the influenza visitation. Kala-azar considerably increased in prevalence, and caused greater mortality than in any year since 1911. There were 2003 deaths, compared with 1508 in the year preceding; this increase occurred in every district except Nowgong. Active operations have been carried out in all the infected areas, the results of which are promising. Three cases of imported plague occurred in April; all necessary measures were taken, and happily there was no extension of the disease. The jail mortality in this province was only 21·42 per 1000 (the death-rate for the general population having been, as already mentioned, 46·10 per 1000), a most gratifying result to all concerned. Major Young, who is also Inspector-General of Civil Hospitals, reports a slight increase in mortality in the lunatic asylums of the province, 58·4 compared with 55·6 per 1000 in the previous year, the percentage of admissions in bad health (27·88) having been higher than in 1917, when it was 19·38, connected, no doubt, with the prevalent influenza epidemic.

The United Provinces.

In the United Provinces of Agra and Oudh the birth-rate was 39·89, and the death-rate 82·37 per 1000; the former was much below the quinquennial average (45·05), and the latter enormously higher than the average (33·15). The low birth-rate is not surprising "in view of the extreme unhealthiness of the year, and the prevailing exceptionally bad economic conditions." The increase in the death-rate is stated by Colonel C. Mactaggart, I.M.S., the Sanitary Commissioner, to be "unprecedented in the recorded history of these provinces," owing to cholera, plague, and relapsing fever in the early part of the year, and to a great epidemic of influenza in the autumn. This epidemic prevalence and the high mortality were "undoubtedly, to a very considerable extent at least, the result of war conditions, and especially of high prices and the consequent defective feeding and clothing of a large proportion of the population." The infantile mortality was 303·5 per 1000 births (compared with 255·0 for the decennium, 1901–10). Only once during the past 28 years has this ratio been exceeded (345·1 in 1908), due to excessive prevalence of malaria in that year. One-fifth of this infantile mortality was due to tetanus, which was, however, less than in previous years. Distribution of pamphlets of instruction to mothers and midwives, courses of training for native nurses, and the provision of coöperative dairies for the supply of pure milk are all measures of improvement in active operation.

A severe outbreak of cholera caused 119,746 deaths (2·56 per 1000, compared with 1·23 for the decennium 1908–17). It is considered that the intensely hot weather and failure of the rains, leading to deficiency of water and its contamination, was the chief cause of the prevalence; it was not due to the great fair at Allahabad (*Kumbh Mela*) in the previous year. Permanganate of potash was unfortunately not available as a disinfectant, and bleaching powder was used, which, on account of its instability, is far less efficient. Plague was more prevalent than in recent years, the mortality having been at the rate of 3·73 per 1000, compared with 1·91 for the quinquennium preceding (1913–17). Rat destruction has never given satisfactory results in these provinces, and evacuation of infected dwellings, together with inoculation, are considered to be the only measures of practical value. A change has been made in the administration of the medical school at Agra; the male and female departments have been separated and the designation of the female school altered to "Women's Medical School." There are 62 female students on the roll and in the male medical school 714 students (compared with 618 in 1916–17). A new medical school is intended to be established at Allahabad. Owing to war conditions four large district jails were handed over to the Military Department in 1917, entailing a loss of accommodation for nearly 3000 prisoners. Moreover, there was already a deficiency in this respect; therefore the authorities had to face considerable difficulties in regard to administration. A new jail is urgently required in the neighbourhood of Meerut. Lieutenant-Colonel S. H. Henderson, I.M.S., Inspector-General of Prisons, refers to the great number of youthful offenders under 15 years of age, and considers that some should have been whipped and released. A great deal of work, in the way of making blankets for the Munitions Department, was carried out successfully, almost entirely by hand. The health conditions were not satisfactory, the admissions to hospital having been 675·7 per 1000 (compared with 371·1 in 1917),

and the death-rate 46·0 (compared with 13·2 in 1917). This death-rate was the highest recorded or 50 years. More than half the deaths were returned as influenza (723), and of the 94 deaths from pneumonia probably many were due to the former disease. It is considered that this influenza epidemic "will continue to affect the general health of the prison population for a long time to come." In the Muttra jail the death-rate was actually 200·8 per 1000, 42 of the 50 deaths having been due to influenza. This epidemic also led to an increase in pulmonary tuberculosis throughout the province; out-door treatment is practised even in the hottest months of the year, suitable protection from the sun being provided. It is not necessary to emphasise the difficulties in carrying out jail administration under war conditions and in presence of widespread and severe epidemics.

(To be continued.)

SCHOOL MEDICAL INSPECTION: ITS ORIGIN AND GROWTH.

IN the first of a series of lectures on the medical inspection of school children arranged by the London County Council at the Oliver Goldsmith School, Peckham-road, Dr. Frederick Langmead, on Nov. 5th, interested a crowded audience with an account of the genesis and growth of the medical inspection of schools, the need for such inspection, and the ways in which teachers can coöperate in making inspection effective.

Like many other things, both good and evil, he said, medical inspection in schools had its birth in Germany; for the movement may be said to have been started by Hermann Cohn, who in 1866 made investigations into the eyesight of over 10,000 children in Breslau. In 1880 Priestley Smith, of Birmingham, studied the question of eyesight in education and two years later Dr. Clement Dukes, of Rugby, wrote a book on the subject of health in the school. The introduction of the doctor into the school started from this time. In 1890 the London School Board first appointed a medical officer for its school area, and in 1893 Bradford followed London's example. In 1903 there was further activity in the matter, when a Royal Commission to investigate physical training was appointed and its report discussed the need for medical inspection both for remedial purposes and also to gauge the national physique and to suggest means for its improvement. In 1904 an Interdepartmental Committee drew attention to the need for physical training and more complete medical inspection in schools, and later an inquiry was made into the arrangements then being made to this end. In 1905 there were 48 areas in which something was being done on the medical side in regard to the inspection of school children, and in 1907 a great move forward was made by the Act, which set out that all local educational authorities should provide for the medical inspection of school children in elementary schools. Medical treatment, however, was not compulsory, though children had to be inspected on their admission to a school and the investigations followed up. In 1914 a third compulsory inspection was added, to take place at the age of 8. Afterwards the Act was extended to continuation and secondary schools, and the provision of treatment was made compulsory.

The Need for Inspection.

To show the magnitude and seriousness of the problem presented by physical defects in school children, both with regard to their educational capacity and their health, Dr. Langmead quoted from Sir George Newman's report of 1916. This report showed that out of about six million children upwards of 10 per cent. were unclean, 10 per cent. were ill-nourished, about three million were in need of dental treatment, and not less than half a million urgently so. Upwards of half a million were so defective in eyesight as to be unable to take reasonable advantage of their lessons. Disease of the ear and throat accounted for another half million, and significant proportions suffered from skin diseases and tuberculous affections, while probably no less than a million of children were so physically or mentally defective or diseased as to be unable to derive reasonable benefit from the facilities for education which the State provided. A surprise examination made by Dr. C. J. Thomas, assisted by Dr. R. H. Norman, last year of 300 London children and 275 country children, representing schools of various types from the very poor to the middle class, showed that in the London group 7 per cent., and in the country 10 per cent., of the children were absent on grounds of more or less chronic ill-health. After deduction of the blind, deaf, and mentally and physically defective in those schools, 21 per cent. were found to be suffering from more or less serious defects which interfered with their school instruction and which would afterwards prevent them from taking their proper places as citizens, and would probably swell the returns of premature mortality. Twelve per cent. were ill-nourished, 19 per cent. unclean in body, and 7·5 per cent. had body vermin. Other diseases also showed a large percentage. The statistics showed that the problem presented by mental and physical defects was no phantom, but one which must be met and fought by every possible means.

Machinery had been provided to deal with this state of things. Detection was followed by treatment which, however, was only slowly accomplishing its work by reason of an enormous amount of prejudice and ignorance. But detection and treatment were not the only means of combating the physical defects of school children: more important than these was prevention. Prevention began before the birth of the child in the proper supervision of the expectant mother and of her employment; it continued during infancy by educating and assisting the mother, and it was intimately connected with sanitation in its widest sense. One way of helping in this direction would be the giving of specific lessons on hygiene in the school classes and another now recommended to teachers in the London County Council schools, was that every opportunity should be given through out the day's curriculum to point out to the children the path of hygienic rectitude.

Need for Coöperation of the School Teacher.

The school teacher could render valuable service by giving scrupulous attention to hygienic laws, making his class room into a standing object-lesson by taking every opportunity of inculcating hygienic principles and practices; by helping to detect physical defects in order to point them out to the school doctor or nurse; by arranging the desks of the class on hygienic lines with regard to seeing and hearing; by correcting working attitudes (a great source of spinal curvature), and by seeing that the children who wore spectacles did wear them. All these things and many others might be done by the teacher without adding to any extent to his other work, and while of great advantage to the child, would also assist the teacher. The active coöperation of the head teacher was also necessary. No matter how skilfully instruction might be given by the teacher, the child who was suffering from any kind of physical or mental defect would not properly react to that instruction, and it behoved everyone to consider carefully and seriously how the problem could be met and effectively dealt with.

TRAINING FOR DISABLED NURSES.

THE Ministry of Labour is granting training allowances to disabled nurses on receipt of a certificate from the pensions medical officer that the candidate is fit for the new occupation. Nurses in receipt of a pension and prevented by disability, incurred on military service, from following their former occupation are eligible. Application should be made to the Controller, Women's Training Branch, Ministry of Labour, St. Ermin's Hotel, Westminster, marked "Disabled nurse."

OLD AGE PENSIONS.

THE Departmental Committee on Old Age Pensions have issued Majority and Minority Reports, which differ mainly on the question of means limit and not on the amount of the pension or the age at which it should begin. Both reports recommend an increase in the scale from 7*s.* 6*d.* to 10*s.* a week and the retention of the present age-limit of 70 years. The Committee was unanimous in recommending the abolition of the Poor-law disqualification of applicants for pensions or pensioners, as regards out-door relief; also that pensions should accrue from the Friday following the date of the receipt of the claim; that there should be no disqualification following a term of imprisonment; and that pensions should be made unalienable under the Debtors Acts. There are also certain other unanimous suggestions as to terms of residence and the treatment of aliens.

With regard to the means limit, the Majority Report recommends its entire abolition and the Minority its increase to £63—just double the existing limit. The Minority also suggest certain modifications in the method of calculating means.

THE NATIONAL INSURANCE RETURN.

To the Editor of THE LANCET.

SIR,—I have read with interest the Parliamentary Intelligence in THE LANCET of Nov. 8th, giving a return of receipts and expenditure in round figures under the National Health Insurance Acts in the year 1918 for England and Wales. Among the receipts there is an item, "Interest and sundry receipts, £2,360,000." Supposing that the "sundry receipts" form £360,000 of this, that leaves £2,000,000 received as interest, and, taking it at 5 per cent., that presupposes a capital reserve somewhere of £40,000,000. Also, amongst the "Expenditure" are "Sums invested," £9,847,000. This is supposedly added to the capital reserve, making a total reserve fund perhaps of £50,000,000, but, naturally, in a "Receipts and Expenditure" account capital reserve is not shown. It would be interesting to know what the capital account of the National Health Insurance is. Perhaps my reading is incorrect.

I am, Sir, yours faithfully,

Nov. 11th, 1919. INTERESTED.

SUPPLEMENT to THE LANCET, NOV. 15th, 1919

METEOROLOGICAL OFFICE

Advisory Committee on Atmospheric Pollution

REPORT ON OBSERVATIONS IN THE YEAR ENDING MARCH 31, 1919

Forming the Fifth Report of the Committee for the Investigation of Atmospheric Pollution

INTRODUCTION.

THIS is the Fifth Annual Report of the Committee. It follows the lines of previous Reports, except as indicated below.

As mentioned in previous Reports, great delay has been incurred in the publication due to the returns from the Observing Stations not being sent in in time. The delay in sending in such returns has been due to war conditions, and it is, therefore, expected that in the future the Reports will be issued within three or four months of the termination of the year dealt with. The authorities who have set up deposit gauges have been asked to see that the returns for any particular month are sent in within two months of that date. If this is carried out, as the Committee have no reason to doubt will be the case, there should be no difficulty in getting the Reports out in good time.

It is satisfactory to be able to report that the number of Observing Stations has suffered no serious diminution during the last year, and it is confidently expected that further Stations will be set up in the near future. The Committee would like again to draw attention to the advantages arising from the setting up of Observing Stations. It is, for example, impossible to say whether the air of a city is improving as a result of the efforts of the Local Sanitary Authorities unless accurate data are obtainable. Again, there are doubtless many cities, especially in the manufacturing districts, which suffer from impurities in the air which have their source in neighbouring centres and which are carried by the wind; it would obviously be of importance to ascertain whether the impurity in a city is due to its own smoke and sources of pollution or whether it is derived from some other city not far removed.

It should be very much to the advantage of health resorts also to be able to show that the air is not polluted, and some, at least, of our health resorts, especially in the large seaside towns, might find some improvement desirable.

The health of the community is probably its most important asset. This has been recognised by the Government in the appointment of a Ministry of Health which took over the duties from the Local Government Board on July 1st. It is to be hoped that the purification of the air we have to breathe will be regarded by the new Ministry as one, at least, of their important duties, and it is obvious that to obtain a measure of the improvement in purity of the air the collection of data such as this Committee has undertaken is of the highest importance.

As in the later Reports during the war, the full tables of results from each Station are not given, but they are available for reference in THE LANCET, and the following is a list of the dates of the issues in which these returns may be found :—

Return for—							
April, 1918.	Published in THE LANCET of	July	5th,	1919.			
May,	,,	,,	,,	,,	,,	,,	,,
June,	,,	,,	,,	,,	Aug.	2nd,	,,
July,	,,	,,	,,	,,	,,	,,	,,
Aug.,	,,	,,	,,	,,	,,	16th,	,,
Sept.,	,,	,,	,,	,,	,,	,,	,,
Oct.,	,,	,,	,,	,,	Sept.	13th,	,,
Nov.,	,,	,,	,,	,,	,,	,,	,,
Dec.,	,,	,,	,,	,,	Oct.	18th,	,,
Jan., 1919.	,,	,,	,,	,,	,,	,,	,,
Feb.,	,,	,,	,,	,,	Nov.	1st,	,,
Mch.,	,,	,,	,,	,,	,,	,,	,,

Full returns are given for two stations which have been selected as giving the lowest and highest total deposits for the year.

TABLE I.—*Monthly Deposit at Two Selected Stations, Newcastle-on-Tyne and London, Wandsworth Common.*

Month.	Station.	Rainfall in millimetres.	Metric tons per square kilometre.								
			Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.		
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphates as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).
1918.											
April	Newcastle-on-Tyne ...	31	0·18	4·23	7·71	1·50	2·87	16·48	1·42	0·44	0·15
,,	Wandsworth Common	20	Trace	0·27	1·40	0·77	1·72	4·15	0·93	0·32	0·04
May	Newcastle-on-Tyne ...	35	0·28	3·19	8·83	1·89	2·31	16·50	1·56	0·36	0·13
,,	Wandsworth Common	20	Nil	1·30	7·83	0·01	2·14	11·27	0·85	0·24	0·04
June	Newcastle-on-Tyne ...	14	0·11	1·12	2·43	0·97	1·92	6·55	0·94	0·26	0·02
,,	Wandsworth Common	12	0 02	0·44	1·18	0·72	1·50	3·85	0·57	0·24	0·03
July	Newcastle-on-Tyne ...	93	0·16	5·24	7·35	3·63	11·21	27·61	4·16	0·92	0·14
,,	Wandsworth Common	13	—	0·01	—	0·58	0·91	1·51	0·36	0·14	0·04
Aug.	Newcastle-on-Tyne ...	31	0·16	3·16	7·80	1·43	3·24	15·77	1·50	0·30	0·07
,,	Wandsworth Common	50	0·01	0·01	0·10	1·49	3·27	4·88	1·23	0·42	0·01
Sept.	Newcastle-on-Tyne ...	112	0·10	2·86	4·33	2·23	4·46	13·99	2·45	0·91	0·28
,,	Wandsworth Common	18	0·05	0·87	4·66	0·58	1·26	7·42	0·44	0·12	0·04
Oct.	Newcastle-on-Tyne ...	55	0·12	4·36	5·91	1·85	2·94	15·19	1·61	0·39	0·18
,,	Wandsworth Common	—	—	—	—	—	—	—	—	—	—
Nov.	Newcastle-on-Tyne ...	30	0·10	3·16	9·05	1·79	4·42	18·51	2·05	0·42	0·09
,,	Wandsworth Common	19	Trace	0·02	0·15	0·52	1·76	2·46	0·87	0·17	0·03
Dec.	Newcastle-on-Tyne ...	71	0·14	3·16	6·23	2·57	2·57	14·67	1·71	0·48	0·24
,,	Wandsworth Common	—	—	—	—	—	—	—	—	—	—
1919.											
Jan.	Newcastle-on-Tyne ...	60	0·24	5·87	8·84	2·03	6·33	23·30	2·15	0·76	0·13
,,	Wandsworth Common	6	Nil	Nil	Nil	0·33	0·54	0·88	0·34	0·13	0·01
Feb.	Newcastle-on-Tyne ...	29	0·06	2·79	4·35	2·46	2·91	12·56	1·38	0·43	0·12
,,	Wandsworth Common	18	Nil	0·15	0·42	0·78	1·48	2·84	1·00	0·44	0·04
Mar.	Newcastle-on-Tyne ...	55	0·17	7·15	12·49	2·40	4·58	27·24	1·93	0·77	0·12
,,	Wandsworth Common	6	Nil	Nil	Nil	0·33	0·40	0·73	0·30	0·07	0·01

List of tables.—The tables published in this Report are similar to those in the Fourth Report. One new table is, however, included showing average monthly deposit of each element for the last four years. A list of the tables is given below:—

1. Monthly deposit for two selected stations—i.e., Wandsworth Common (London) and Newcastle-on-Tyne. Newcastle-on-Tyne gives about the highest and Wandsworth Common the lowest deposit in the stations for which complete analyses are available.
2. Total solids deposited monthly at all stations.
3. Mean monthly deposits at all stations for summer half year April to September, 1917 and 1918.
4. As No. 3, but for the winter half years October to March, 1917–18 and 1918–19.
5 and 6. Classification of the stations under Groups A, B, C, and D, according to the amount of the various elements of pollution for the same periods as in Nos. 3 and 4.
7 and 8. Totals of stations classed A, B, C, and D for each element of pollution for summer and winter months. These totals are prepared from Nos. 5 and 6, and cover the same periods.
9. Comparison of mean monthly deposit during summer and winter.
10. Average deposit of each element of pollution for each month for the following groups of stations:—
   (*a*) Nine stations as given in Table VII.
   (*b*) Two London stations.
   (*c*) Five Glasgow stations.
11. Average deposit of each element of pollution for each month for the four-year period ending March 31st, 1919, for a group of nine stations.

The inequality in the number of days in a month has been dealt with as in the Fourth Report—i.e., where a comparison is to be made between different months the figures given are for a standard 30-day month, thus eliminating any errors in comparison due to the different number of days per month.

In Table I., giving specimen returns for two Stations, some difficulty has arisen in selecting the Stations showing the highest and lowest deposits. The two Stations given—i.e., Wandsworth Common and Newcastle-on-Tyne—were selected on a basis of total solids deposited. It will be seen from Table II. that Malvern made no returns during this year, owing to Captain Thorpe's absence on War service. It will be remembered that in all previous Reports Malvern showed the lowest deposit of any Station. The actual highest figures for total solids for this year were as follows:—

		Tons per K^2
Rochdale	with a monthly deposit of	30·28
London:		
Embankment Gardens	,, ,, ,,	22·20
St. Helens	,, ,, ,,	17·77
Newcastle-on-Tyne ...	,, ,, ,,	17·28

Rochdale unfortunately does not return a complete analysis, while Embankment Gardens and St. Helens were not considered as giving such reliable results for this year as Newcastle-on-Tyne. The last Station was, therefore, selected as representing a high deposit.

Some of the returns for this year must be regarded as of somewhat doubtful value owing to the reasons set forth in the last Report, and any such results which were thought to be of doubtful accuracy have been marked in the Tables by an asterisk in front of the name of the Station, in a way similar to that adopted in the Fourth Report.

TABLE II.—*Total Solids Deposited Monthly at all Stations, in Metric Tons per Square Kilometre.*

Station.	1918.									1919.			Mean monthly deposit for year.
	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov	Dec.	Jan.	Feb.	March.	
Leicester (*a*	19·85	—	—	—	—	—	—	—	—	—	—	—	—
London:—													
Meteorological Office (*b*)	17·04	15·81	5·10	15·01	4·79	—	—	—	9·79	4·16	14·95	11·61	10·90
*Embankment Gardens	15·99	12·24	6·86	—	8·21	20·20	26·57	17·36	51·93	18·80	21·15	44·93	22·20
*Finsbury Park	19·56	22·01	6·32	14·07	10·77	—	17·45	19·44	13·55	20·33	21·59	15·63	16·43
*Ravenscourt Park ...	10·11	17·14	5·45	20·19	4·32	12·04	6·09	13·05	12·31	12·40	13·45	13·03	11·63
*Southwark Park... ...	16·36	8·74	8·93	18·02	8·54	23·73	13·32	21·68	8·05	18·44	25·00	30·24	16·75
Wandsworth Common	4·15	11·27	3·85	1·51	4·88	7·42	—	2·46	—	0·88	2·84	0·73	3·99
Golden Lane	18·24	14·08	7·33	12·98	9·34	12·37	11·23	14·84	10·91	12·04	18·79	13·58	12·99
Victoria Park	7·59	24·39	—	14·15	8·27	6·95	7·29	12·78	14·10	—	—	7·02	11·39
Malvern (*a*)	—	—	—	—	—	—	—	4·55	—	—	—	—	—
Manchester:—													
Queen's Park (*c*)... ...	6·50	14·10	—	—	—	—	—	—	—	—	—	—	—
Whitworth Street (roof of College) (*d*)	—	—	—	—	12·00	26·10	11·30	15·70	15·90	—	—	—	—
Whitworth Street (garden)	12·70	16·80	12·50	14·30	12·20	24·90	10·40	15·80	16·80	—	—	—	15·16
Newcastle-on-Tyne... ...	16·48	16·50	6·55	27·61	15·77	13·99	15·19	18·51	14·67	23·30	12·56	27·24	17·28
Rochdale (*c*)	34·80	34·80	34·80	32·88	32·88	32·88	23·16	23·16	23·16	—	—	—	30·28
*St. Helens	10·72	19·09	21·07	12·80	14·01	21·09	17·36	17·25	18·10	25·03	21·54	15·17	17·77
Southport:—													
Hesketh Park	3·28	7·04	4·64	6·67	6·01	11·80	3·89	13·33	9·75	8·29	3·25	7·72	7·17
Woodvale Moss	4·02	7·51	4·36	7·22	5·51	9·35	2·73	5·73	9·86	6·44	2·69	6·41	5·99
Coatbridge	6·64	14·12	11·38	15·40	25·97	19·98	17·55	24·43	19·57	—	13·67	—	16·87
Glasgow:—													
Alexandra Park	8·84	11·24	6·83	14·35	9·26	10·67	14·61	16·12	13·99	13·29	11·34	9·27	11·68
Bellahouston Park ...	4·27	14·79	8·68	9·28	10·57	—	—	—	—	—	—	13·75	—
Blythswood Square ...	6·78	11·87	6·13	6·04	11·32	11·70	17·92	15·04	13·69	17·24	13·90	16·20	12·32
Botanic Gardens	6·23	18·78	8·40	12·26	13·46	15·77	34·26	20·55	17·16	18·44	16·82	17·23	16·61
Richmond Park	4·62	10·80	8·58	12·24	16·95	—	—	—	—	—	—	12·90	—
Ruchill Park	6·14	15·34	7·63	6·43	12·55	12·04	14·83	12·82	11·83	10·98	7·24	11·65	10·79
South Side Park	3·87	15·45	7·45	11·07	11·70	10·86	19·79	12·67	9·26	9·44	8·53	14·32	11·20
Tollcross Park	8·33	13·15	9·91	16·70	14·16	—	—	—	—	—	—	13·27	—
Victoria Park...	4·36	16·03	7·86	10·24	12·39	—	—	—	—	—	—	15·71	—

(*a*) Observations suspended. (*b*) Sept.–Oct.–Nov. results lost: bottles overflowed. (*c*) Use of this gauge discontinued. (*d*) Roof gauge 96' 0" above garden gauge. Observations started in August. (*e*) Deposit collected quarterly. Water lost, probably July, Aug., and Sept. are underestimated. Glasgow records not taken owing to pressure of war work. * See p. ii.

It will be understood that the steps taken to correct such possible inaccuracies could not take effect until after the year now under consideration; the Committee have arranged for a careful annual inspection to be made of all deposit gauges in the future, with a view to ensuring that they are kept in good condition.

THE STANDARD GAUGE.

The Standard Gauge, which was fully described in the Committee's First Report, for the year 1914–15, has developed certain minor defects, which defects and the methods of remedying them have been under the careful consideration of the Committee for some time.

It will be remembered that in all cases the work of the Observing Station, including care of the gauge, collection of deposited matter, and analyses, has been the duty of the local authorities. The Department of Scientific and Industrial Research have urged the Committee, however, to arrange for periodical inspection of these stations, and the first of these inspections was made early this year when certain defects to be described below were discovered.

The actual collecting vessels are made of cast iron enamelled on the inside with a vitreous enamel, which had been carefully tested and was expected to withstand the effects of weathering; but recently this enamel has shown some evidence of deterioration, especially in cities with heavy deposits.

The selection of this form of vessel in preference to a smaller one of glass was made owing to the extremely small quantity of certain of the elements of deposit collected in a month. The catchment area of the Standard Gauge is about four square feet, and even with this large area the quantity of tarry matter, chlorine, and ammonia is so very small that any reduction would make it extremely difficult to obtain results of useful accuracy. For example, the following figures for Wandsworth Common (London) show the total insoluble matter per month during the six summer months of 1918 and the amount of tarry matter soluble in CS_2.

Wandsworth Common (London) 1918, Deposit in Grammes.

—	April.	May.	June.	July.	August.	Sept.
Total insoluble matter...	0·64	3·51	0·63	0·003	0·047	2·15
Tarry matter ...	Trace	0	0·007	0	0·004	0·109

It will be seen from this that the area of the gauge is at present none too big.

The enamelled surfaces of these gauges were found in all cases, except Malvern, our only country station during 1918, to have lost their bright glazed surface, and to have developed a slight coating of white powder which could be detected on rubbing with the fingers. This, of course, necessitated great care in the analyses to avoid error.

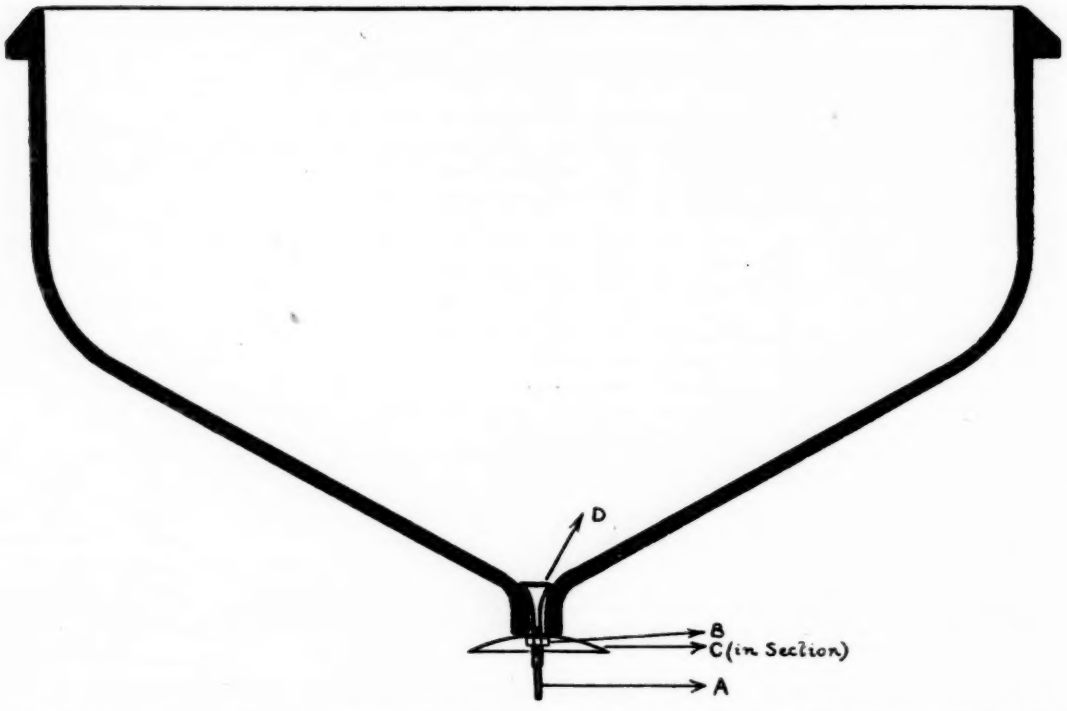
In order to remedy this defect the Committee have experimented with different varnishes which could be applied to the existing gauges to protect the surface of the enamel, and also to protect parts where the enamel had become chipped off, exposing the metal underneath. A varnish has now been found which appears to fulfil the necessary conditions, and is under test on the Committee's experimental gauge at the Meteorological Office. If it proves finally satisfactory the other gauges will be coated with it.

Such a remedy is, naturally, not as satisfactory as if an enamel which would resist the acids of the air had initially been found. As such an enamel is now available, mainly owing to researches conducted during the war, future gauges for new stations will be coated with this acid proof enamel.

Another slight defect arose in connexion with the glass communicating-tube between the gauge vessel and the bottles. This was originally cemented into the outlet opening of the gauge vessel, but it was found too liable to breakage, also no provision could be made for preventing the tube being pushed up into the vessel when attaching the rubber connexion.

To remedy this a copper connexion has been designed, as shown in the illustration below. This shows a section through the gauge vessel and connexion. A small copper tube, D, is cemented into the gauge opening and held in position by a lock nut, B, which effectually prevents it being pushed up into the gauge. Between the lock nut, B, and the gauge vessel, an inverted saucer, shown in section at C and about 4 inches in diameter, is fixed, the function of this being to divert drips from the outside of the gauge vessels from entering the necks of the collecting bottles. In some of the gauges used during the war, owing to the impossibility of getting stoppered bottles, open-neck carboys had to be used, and there is a suspicion that in some cases drips from the outside of the gauge vessel obtained access to the bottle through the open neck. With the copper connexion above described these difficulties should disappear.

GAUGE VESSEL WITH COPPER CONNEXION.



In a few cases the position of the standard gauge was such that it was subject to artificial pollution, in some cases by boys throwing dirt into the vessel, and in others by leaves blown from trees. It is impossible to avoid entirely such artificial pollution, but great care is taken in compiling the results to eliminate any figures showing evidence of such.

During the war it was impossible for the different authorities to devote as much attention as they otherwise would have done to the gauges and collection, hence defects arose such as above described, but it is believed that such defects need not be anticipated in the future.

RESULTS OF YEAR 1918–19.

Comparison with Previous Figures.

Reference must now be made to Tables III. and IV., which show a comparison of the year 1917–18 with 1918–19.

In these tables all the elements of deposit are dealt with, but, as in the Fourth Report, the deposit of total solids will be used as a basis of comparison. Tables III. and IV. have been further analysed into two groups showing for the summer and winter months respectively the stations in which the deposit was increased and those in which it was diminished in the year 1918–19 as compared with 1917–18. Tables A and B show this analysis.

TABLE A.—*Total Solids Deposited in Summer Months, 1918, expressed as Percentages of Deposit in the same months 1917.*

Deposit.			
Increased in 1918.		Diminished in 1918.	
London :—		London :—	
Meteorological Office	108	Embankment Gardens	55
Wandsworth Common	102	Finsbury Park	88
		Ravenscourt Park	67
		Southwark Park	82
		Golden Lane	94
		Manchester :—	
		Queen's Park	87
		Whitworth-street (garden)	99
		Newcastle-on-Tyne	63
		Rochdale	98
		St. Helens	83
		Coatbridge	98
Glasgow :—		Glasgow :—	
Victoria Park	111	Alexandra Park	83
		Bellahouston Park	72
		Blythswood Square	51
		Botanic Gardens	90
		Richmond Park	76
		Ruchill Park	72
		South Side Park	94
		Tollcross Park	79
		Victoria Park	93

Stations not included: Victoria Park (London), Manchester (roof of College), and Southport Stations—all new stations in 1918. Malvern: Observations suspended. Leicester: Only one record.

Referring to this analysis for the summer months, it is obvious that there is a considerable diminution of the deposit in 1918 as compared with 1917 in the majority of stations. The figures opposite each station show the total deposit as percentages of that in 1917. Referring now to the right-hand column, which shows the stations in which the deposit is diminished, the greatest diminution was shown opposite Blythswood-square, Glasgow, where only 51 per cent. of the deposit of 1917 was reported. It is noticeable that there is indication of distinct improvement of the Glasgow air this year as compared with 1917. Reference to last Report will show that in the summer of 1917 nearly all Glasgow stations showed a heavier deposit than in the previous year.

Turning now to the winter months, and neglecting the Glasgow figures, as there was only a single month's record available for 1918–19, we see that the position of affairs is reversed, the winter deposit being greater in 1918–19 than in 1917–18 in the majority of stations. Ravenscourt Park heads the list for increased deposit with a figure showing 149 per cent. of the 1917–18 figure, whereas Wandsworth Common shows only 32 per cent. of the total solids deposited in 1917–18.

TABLE B.—*Total Solids Deposited in Winter Months 1918–19 expressed as Percentages of Deposits in the same months 1917–18.*

Deposit.			
Increased in 1918–19.		Diminished in 1918–19.	
London :—		London :—	
Finsbury Park	137	Wandsworth Common	32
Ravenscourt Park	149		
Southwark Park	110		
Golden Lane	107		
Embankment Gardens	118		
Manchester :—			
Whitworth Street (garden)	110		
Newcastle-on-Tyne	117	St. Helens	91
Coatbridge	111	Rochdale	91
Glasgow :—		Glasgow :—	
Botanic Gardens	114	Alexandra Park	89
Blythswood Square	107	Ruchill Park	77
		South Side Park	94

Stations not included :—Glasgow : Bellahouston, Richmond, Tollcross and Victoria Parks, also Malvern, as there is only one record for winter months; Manchester (roof of College) and Southport—new stations.

Although the stations have been compared above on the basis of total solids deposited, it is not suggested that this is the only basis on which a comparison should be made. Tables III. and IV., however, give the figures and enable comparisons to be made on the basis of any of the elements of deposit, such, for example, as tar or sulphate. But unfortunately all the stations do not provide complete analyses; hence it has been thought better to limit the comparison here to that of total solids deposited. By the classification of stations under letters A, B, C, and D, which will next be considered, a simple method is provided for comparing the results of the year with previous years for any of the elements of pollution.

In Tables V. and VI. the stations are classified under the letters A, B, C, and D, the units being similar to those used in the Committee's previous Reports. The classification units are here given for convenience of reference.

Class A includes the stations which have less than 1 unit of deposit per square kilometre.

Class B, the stations which have between 1 and 3 units of deposit per square kilometre.

Class C, the stations which have between 3 and 5 units of deposit per square kilometre.

Class D, the stations which have 5 or more units of deposit per square kilometre.

The unit has been adjusted to suit each separate element, but the proportional division has been

TABLE III.—SUMMER RESULTS.

Comparison of Mean Monthly Deposit for each Station for Half Years April to September, 1917 and 1918.

Station.	—	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for mean.
			Insoluble matter.			Soluble matter.		Total solids.	Included i soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Leicester	1917	57	0·13	3·42	7·15	1·53	2·82	15·04	1·47	0·44	0·19	6
	1918	61	0·18	3·33	6·10	3·62	6·62	19·85	1·83	0·62	0·22	1
London :—												
Meteorological Office ...	1917	83	0·10	1·42	3·30	2·02	3·87	10·72	1·56	0·63	0·15	6
	1918	70	0·10	1·91	2·76	2·00	4·78	11·55	1·59	0·69	0·22	5
*Embankment Gardens	1917	64	0·29	4·61	8·34	3·42	6·31	22·97	3·41	0·84	0·19	5
	1918	38	0·10	1·60	2·31	2·87	5·83	12·70	2·69	0·72	0·13	5
*Finsbury Park	1917	76	0·09	2·63	8·01	2·05	3·80	16·57	2·16	0·55	0·09	6
	1918	51	0·06	1·59	7·86	1·69	3·34	14·55	1·45	0·37	0·07	5
*Ravenscourt Park ...	1917	86	0·29	2·71	8·80	1·98	3·46	17·23	1·93	0·55	0·13	6
	1918	57	0·07	1·74	5·10	1·75	2·89	11·54	1·35	0·40	0·16	6
*Southwark Park	1917	48	0·04	2·27	6·71	2·83	5·18	17·03	2·89	0·65	0·12	6
	1918	43	0·08	1·83	5·61	2·74	3·80	14·05	2·21	0·53	0·14	6
Wandsworth Common	1917	33	0·02	0·24	0·78	2·05	2·29	5·37	1·10	0·32	0·05	6
	1918	22	0·01	0·50	2·53	0·69	1·80	5·51	0·73	0·25	0·03	6
Golden Lane	1917	70	0·06	2·29	4·80	2·03	4·01	13·17	2·01	0·69	0·26	6
	1918	77	0·10	2·63	3·63	1·75	4·29	12·39	2·07	0·86	0·28	6
Victoria Park	†1917	—	—	—	—	—	—	—	—	—	—	—
	1918	40	0·06	1·84	7·20	1·12	2·06	12·27	1·20	0·25	0·09	5
Malvern	1917	69	0·00	0·30	0·49	0·73	1·66	3·09	0·74	0·18	0·03	6
	†1918	—	—	—	—	—	—	—	—	—	—	—
Manchester :—												
Queen's Park	1917	59	—	—	—	—	—	11·91	—	—	—	6
	1918	64	—	—	—	—	—	10·30	—	—	—	2
Whitworth-street (roof of College)	1917	—	—	—	—	—	—	—	—	—	—	—
	1918	145	—	—	—	—	—	19·05	—	—	—	2
Whitworth-street (garden)	1917	65	—	—	—	—	—	15·70	—	—	—	6
	1918	98	—	—	—	—	—	15·60	—	—	—	6
Newcastle-on-Tyne	1917	71	0·24	5·30	12·69	2·52	4·96	25·71	2·44	0·45	0·17	6
	1918	53	0·17	3·30	6·41	1·94	4·34	16·15	2·00	0·53	0·13	6
Rochdale	1917	—	—	—	—	—	—	34·62	—	—	—	5
	1918	112	—	—	—	—	—	33·84	—	—	—	6
*St. Helens...	1917	68	0·29	3·33	8·03	2·18	6·00	19·83	2·72	1·23	0·22	6
	1918	90	0·32	2·49	5·54	2·74	5·34	16·46	2·63	1·60	0·23	6
Southport :—												
Hesketh Park	†1917	—	—	—	—	—	—	—	—	—	—	—
	1918	90	0·02	0·37	0·48	1·58	4·18	6·63	1·67	0·67	0·08	6
Woodvale Moss...	†1917	—	—	—	—	—	—	—	—	—	—	—
	1918	83	—	—	—	—	—	6·33	—	—	—	6
Coatbridge	1917	63	0·10	1·98	6·75	2·29	4·71	15·82	2·51	0·27	0·20	6
	1918	61	0·15	2·37	6·04	2·47	4·55	15·58	2·28	0·28	0·18	6
Glasgow :—												
Alexandra Park	1917	51	0·47	2·03	4·81	1·45	3·60	12·36	1·76	0·15	0·16	6
	1918	56	0·11	2·53	3·85	1·21	2·54	10·26	1·39	0·18	0·12	6
Bellahouston Park ...	1917	60	0·26	2·45	5·05	1·22	4·23	13·21	1·70	0·15	0·10	6
	1918	52	0·10	1·39	4·02	1·31	2·69	9·52	1·42	0·16	0·04	5
Blythswood Square ...	1917	61	0·23	2·54	6·19	4·39	4·35	17·70	2·25	0·19	0·20	6
	1918	62	0·10	1·61	3·30	1·48	2·48	8·97	1·49	0·19	0·15	6
Botanic Gardens	1917	76	0·28	2·24	4·36	1·92	5·04	13·84	2·40	0·17	0·16	6
	1918	72	0·17	1·73	3·97	2·58	4·03	12·48	1·83	0·20	0·07	6
Richmond Park	1917	61	0·23	1·68	6·38	1·73	4·04	14·06	2·15	0·17	0·17	6
	1918	50	0·13	1·49	4·14	1·94	2·93	10·64	1·63	0·26	0·12	5
Ruchill Park	1917	68	0·21	2·02	5·96	1·45	4·34	13·98	2·07	0·15	0·12	6
	1918	58	0·16	1·88	3·53	1·62	2·85	10·02	1·59	0·16	0·07	6
South Side Park	1917	61	0·16	1·60	3·28	1·50	4·14	10·67	1·69	0·10	0·08	6
	1918	69	0·11	1·13	3·02	1·79	4·03	10·07	1·64	0·22	0·07	6
Tolleross Park	1917	52	0·21	1·89	7·52	1·50	4·62	15·73	2·37	0·13	0·10	4
	1918	48	0·16	1·73	4·86	2·52	3·19	12·45	1·57	0·17	0·08	5
Victoria Park...	1917	66	0·25	1·40	4·09	1·70	3·54	10·98	1·87	0·11	0·17	6
	1918	60	0·11	1·49	3·93	2·09	2·54	10·18	1·56	0·25	0·09	5

* See p. ii. † No records.

TABLE IV.—WINTER RESULTS.

Comparison of Mean Monthly Deposit for Each Station for Half Years October to March, 1917–18, and 1918–19.

Station.	—	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for mean.
			Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphate as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Leicester	1917–18	28	0·19	2·71	4·22	1·28	4·37	12·77	2·55	0·31	0·09	6
	†1918–19	—	—	—	—	—	—	—	—	—	—	—
London:—												
Meteorological Office	1917–18	42	0·14	2·18	3·50	1·44	4·15	11·41	1·46	0·63	0·05	6
	1918–19	46	0·14	1·72	4·59	1·33	3·56	10·13	1·33	0·62	0·04	4
*Embankment Gardens	1917–18	43	0·14	2·76	5·48	4·92	12·10	25·40	5·69	1·50	0·24	5
	1918–19	38	0·18	6·89	9·17	4·76	9·11	30·12	4·70	1·15	0·16	6
*Finsbury Park	1917–18	48	0·10	1·08	4·26	2·49	5·16	13·08	3·25	0·54	0·16	6
	1918–19	75	0·19	1·36	4·25	4·38	7·90	17·99	4·79	1·49	0·11	6
*Ravenscourt Park	1917–18	31	0·06	1·15	3·68	1·10	1·87	7·86	1·27	0·27	0·08	6
	1918–19	56	0·08	1·25	2·45	3·13	4·80	11·72	2·83	0·85	0·13	6
*Southwark Park	1917–18	38	0·04	1·67	8·21	2·79	4·92	17·63	2·97	0·63	0·10	6
	1918–19	46	0·13	1·83	3·98	6·79	6·70	19·46	6·35	1·05	0·45	6
Wandsworth Common	1917–18	24	0·02	0·52	2·33	0·79	1·78	5·42	0·98	0·28	0·04	4
	1918–19	12	—	0·04	0·14	0·49	1·05	1·73	0·63	0·20	0·02	4
Golden Lane	1917–18	43	0·11	2·50	4·25	1·82	4·04	12·72	1·85	0·86	0·28	6
	1918–19	57	0·09	3·24	4·08	1·68	4·47	13·57	2·11	0·84	0·18	6
Victoria Park	†1917–18	—	—	—	—	—	—	—	—	—	—	—
	1918–19	32	0·03	0·95	2·27	2·11	4·91	10·29	1·86	0·40	0·05	4
Malvern	1917–18	41	—	0·07	0·21	0·54	1·29	2·12	0·53	0·19	0·01	6
	1918–19	39	—	0·33	1·36	0·61	2·24	4·55	0·90	0·23	0·01	1
Manchester:—												
Queen's Park	1917–18	70	—	—	—	—	—	7·52	—	—	—	6
	†1918–19	—	—	—	—	—	—	—	—	—	—	—
Whitworth-street (roof of College)	†1917–18	—	—	—	—	—	—	—	—	—	—	—
	1918–19	64	—	—	—	—	—	14·30	—	—	—	3
Whitworth-street (garden)	1917–18	54	—	—	—	—	—	12·32	—	—	—	6
	1918–19	64	—	—	—	—	—	13·67	—	—	—	3
Newcastle-on-Tyne	1917–18	41	0·20	3·65	6·99	1·99	3·07	15·90	1·53	0·61	0·08	6
	1918–19	50	0·14	4·41	7·89	2·18	3·96	18·58	1·81	0·54	0·15	6
Rochdale	1917–18	—	—	—	—	—	—	35·00	—	—	—	5
	1918–19	144	—	—	—	—	—	23·16	—	—	—	3
*St. Helens	1917–18	71	0·59	4·13	6·07	3·09	7·10	20·97	3·89	1·86	0·33	5
	1918–19	83	0·20	2·22	3·73	3·71	9·20	19·08	4·63	2·21	0·05	6
Southport:—												
Hesketh Park	†1917–18	—	—	—	—	—	—	—	—	—	—	—
	1918–19	95	0·03	0·68	1·51	1·28	4·21	7·71	1·63	0·92	0·01	6
Woodvale Moss	†1917–18	—	—	—	—	—	—	—	—	—	—	—
	1918–19	71	—	—	—	—	—	5·64	—	—	—	6
Coatbridge	1917–18	61	0·10	2·03	5·47	2·93	6·35	16·88	3·22	0·58	0·21	5
	1918–19	73	0·47	2·86	6·00	3·51	5·96	18·80	3·78	0·64	0·18	4
Glasgow:—												
Alexandra Park	1917–18	87	0·18	2·38	4·58	2·02	5·61	14·75	2·92	0·43	0·19	5
	1918–19	66	0·09	2·20	3·81	2·35	4·66	13·10	2·32	0·38	0·14	6
Bellahouston Park	1917–18	99	0·12	1·37	2·84	3·39	5·07	12·79	3·25	0·58	0·14	5
	1918–19	79	0·04	1·57	2·69	3·30	6·15	13·75	2·99	0·38	0·10	1
Blythswood Square	1917–18	99	0·17	2·14	4·10	1·65	6·58	14·63	3·43	0·51	0·21	5
	1918–19	86	0·19	2·82	4·55	2·48	5·62	15·67	3·14	0·42	0·22	6
Botanic Gardens	1917–18	90	0·28	0·90	4·73	3·15	5·77	14·83	4·15	0·41	0·12	4
	1918–19	96	0·13	2·52	4·32	4·97	8·82	20·74	4·64	0·61	0·18	6
Richmond Park	1917–18	93	0·22	2·45	6·50	2·88	5·09	17·14	3·31	0·29	0·27	6
	1918–19	61	0·09	1·88	3·03	3·29	4·61	12·90	3·32	0·32	0·16	1
Ruchill Park	1917–18	92	0·28	1·73	4·46	2·60	6·00	15·06	3·36	0·50	0·14	5
	1918–19	92	0·11	1·79	2·63	2·37	4·65	11·56	2·79	0·36	0·17	6
South Side Park	1917–18	102	0·18	0·23	4·14	2·15	4·38	13·08	2·72	0·33	0·12	6
	1918–19	84	0·08	1·48	3·13	2·31	5·33	12·33	2·68	0·36	0·18	6
Tollcross Park	1917–18	91	0·26	1·88	5·45	3·76	5·18	16·54	3·44	0·40	0·13	5
	1918–19	61	0·08	1·76	4·33	2·10	5·00	13·27	2·95	0·38	0·16	1
Victoria Park	1917–18	93	0·17	1·55	4·09	3·30	6·18	15·28	3·56	0·37	0·20	4
	1918–19	98	0·04	1·29	2·55	3·95	7·88	15·71	5·44	0·55	0·13	1

* See p. ii. † No records.

kept the same throughout. Thus for "total solids" the unit is 5 tons and the law of classification is—

Class A, less than 5 tons per square kilometre per month.

Class B, from 5 to 15 tons per square kilometre per month.

Class C, from 15 to 25 tons per square kilometre per month.

Class D, 25 or more tons per square kilometre per month.

It will be understood that the figure 5 belongs to Class B, not Class A, and so on.

The units and limits in the several cases are shown in the next column.

	Unit.	Limits.			
		Insoluble Matter.			
—	Tons per K^2 per month	A Less than	B	C	D over
Tar	0·05	0·05	0·05 to 0·15	0·15 to 0·25	0·25
Carbonaceous other than tar	1	1	1 to 3	3 to 5	5
Ash	2	2	2 to 6	6 to 10	10
		Soluble Matter.			
Loss on ignition	0·75	0·75	0·75 to 2·25	2·25 to 3·75	3·75
Ash	1·5	1·5	1·5 to 4·5	4·5 to 7·5	7·5
Total solids	5	5	5 to 15	15 to 25	25
Sulphates ...	1	1	1 to 3	3 to 5	5
Chlorine ...	0·3	0·3	0·3 to 0·9	0·9 to 1·5	1·5
Ammonia ...	0·05	0·05	0·05 to 0·15	0·15 to 0·25	0·25

TABLE V.—*Classification (Summer Months), April to September, 1918.*

Station.	Rainfall in mm.	Metric tons per square kilometre.									Summary.				No. of months.
		Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.							
		Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphates as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	A	B	C	D	
Leicester	61	C	C	C	C	C	C	B	B	C	0	2	7	0	1
London:—															
Meteorological Office	70	B	B	B	B	C	B	B	B	C	0	7	2	0	5
*Embankment Gardens	38	B	B	B	C	C	B	B	B	B	0	7	2	0	5
*Finsbury Park	51	B	B	C	B	B	B	B	B	B	0	8	1	0	5
*Ravenscourt Park ...	57	B	B	B	B	B	B	B	B	C	0	8	1	0	6
*Southwark Park ...	43	B	B	B	C	B	B	B	B	B	0	8	1	0	6
Wandsworth Common	22	A	A	B	A	B	B	A	A	A	6	3	0	0	6
Golden Lane	77	B	B	B	B	B	B	B	B	D	0	8	0	1	6
Victoria Park	40	B	B	C	B	B	B	B	A	B	1	7	1	0	5
Malvern	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Manchester:—															
Queen's Park	64	—	—	—	—	—	B	—	—	—	0	1	0	0	2
Whitworth-street (roof of College)...	145	—	—	—	—	—	C	—	—	—	0	0	1	0	2
Whitworth-street (garden)	98	—	—	—	—	—	C	—	—	—	0	0	1	0	6
Newcastle-on-Tyne ...	53	C	C	C	B	B	C	B	B	B	0	5	4	0	6
Rochdale...	112	—	—	—	—	—	D	—	—	—	0	0	0	1	6
*St. Helens	90	D	B	B	C	C	C	B	D	C	0	3	4	2	6
Southport:—															
Hesketh Park	90	A	A	A	B	B	B	B	B	B	3	6	0	0	6
Woodvale Moss... ...	83	—	—	—	—	—	B	—	—	—	0	1	0	0	6
Coatbridge	61	B	B	C	C	C	C	B	A	C	1	3	5	0	6
Glasgow:—															
Alexandra Park ...	56	B	B	B	B	B	B	B	A	B	1	8	0	0	6
Bellahouston Park ...	52	B	B	B	B	B	B	B	A	A	2	7	0	0	5
Blythswood Square...	62	B	B	B	B	B	B	B	A	B	1	8	0	0	6
Botanic Gardens ...	72	C	B	B	C	B	B	B	A	B	1	6	2	0	6
Richmond Park ...	50	B	B	B	B	B	B	B	A	B	1	8	0	0	5
Ruchill Park	58	C	B	B	B	B	B	B	A	B	1	7	1	0	6
South Side Park ...	69	B	B	B	B	B	B	B	A	B	1	8	0	0	6
Tollcross Park	48	C	B	B	C	B	B	B	A	C	1	5	3	0	5
Victoria Park	60	B	B	B	B	B	B	B	A	B	1	8	0	0	5

* See p. ii.

This classification is based upon the figures shown in the two previous tables (III. and IV.) and covers the same periods—i.e., summer and winter. In Tables VII. and VIII. a group of nine stations have been selected which gave returns over the whole period considered, and the totals of the different classes A, B, C, and D for each element of pollution are given. Again, to enable a more rapid comparison to be made, the two tables (VII. and VIII.) have been reduced by the addition of the A's and B's and the C's and D's, and the results given below.

To compare the two years all we need do now is to examine the column showing the sum of the C's and D's, which figures vary directly with the amount of the deposit, whereas the sum of the A's and B's bears an inverse relation to the deposit.

Comparing the two years 1917–18 and 1918–19 upon this basis, we get the following results:—

Total Solids, Soluble Loss on Ignition, Ash and Ammonia show a diminution in the summer and an increase in the winter of 1918–19 as compared with the previous year.

Tar deposit is less both in the winter and summer of 1918–19 than in the previous year.

Carbonaceous Insoluble shows little difference in the two years, the summer figures being the same, whereas the winter figures show a slight increase in 1918–19.

Insoluble Ash gave smaller deposit in the summer of 1918, whereas the winter deposit of the two years was equal.

Sulphates were the same for the two summers but slightly less for the winter of 1918–19 than the previous winter.

Chlorine gave the same deposits in the two years. It is of interest to observe the great diminution in the deposit of the tar, which may possibly be attributed to improvements in combustion, the increased use of smokeless fuels such as gas, coke, anthracite, or possibly to a reduction in the total

TABLE VI.—*Classification (Winter Months), October, 1918, to March, 1919.*

Station.	Rainfall in mm.	Metric tons per square kilometre. Insoluble matter. Tar.	Carbonaceous other than tar.	Ash.	Soluble matter. Loss on ignition.	Ash.	Total solids.	Included in soluble matter. Sulphates as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	Summary. A	B	C	D	No. of months.
†Leicester	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0
London:—															
Meteorological Office	46	B	B	B	B	B	B	B	B	A	1	8	0	0	4
*Embankment Gardens	38	C	D	C	D	D	D	C	C	C	0	0	5	4	6
*Finsbury Park ...	75	C	B	B	D	D	C	C	C	B	0	3	4	2	6
*Ravenscourt Park...	56	B	B	B	C	C	B	B	B	B	0	7	2	0	6
*Southwark Park ...	46	B	B	B	D	C	C	D	C	D	0	3	3	3	6
Wandsworth Common	12	A	A	A	A	A	A	A	A	A	9	0	0	0	4
Golden Lane	57	B	C	B	B	B	B	B	B	C	0	7	2	0	6
Victoria Park	32	A	A	B	B	C	B	B	B	A	3	5	1	0	4
Malvern	39	A	A	A	A	B	A	A	A	A	8	1	0	0	1
Manchester:—															
†Queen's Park	—	—	—	—	—	—	—	—	—	—	0	0	0	0	0
Whitworth Street (roof of College)...	64	—	—	—	—	—	B	—	—	—	0	1	0	0	3
Whitworth Street (garden)	60	—	—	—	—	—	B	—	—	—	0	1	0	0	3
Newcastle-on-Tyne ...	50	B	C	C	B	B	C	B	B	B	0	6	3	0	6
Rochdale...	144	—	—	—	—	—	C	—	—	—	0	0	1	0	3
*St. Helens	83	C	B	B	C	D	C	C	D	A	1	2	4	2	6
Southport:—															
Hesketh Park	95	A	A	A	B	B	B	B	C	A	4	4	1	0	6
Woodvale Moss ...	71	—	—	—	—	—	B	—	—	—	0	1	0	0	6
Coatbridge	73	D	B	B	C	C	C	C	B	C	0	3	5	1	4
Glasgow:—															
Alexandra Park ...	66	B	B	B	C	C	B	B	B	B	0	7	2	0	6
Bellahouston Park...	79	A	B	B	C	C	B	B	B	B	1	6	2	0	1
Blythswood Square...	86	C	B	B	C	C	C	C	B	C	0	3	6	0	6
Botanic Gardens ...	96	B	B	B	D	D	C	C	B	C	0	4	3	2	6
Richmond Park ...	61	B	B	B	C	C	B	C	B	C	0	5	4	0	1
Ruchill Park	92	B	B	B	C	C	B	B	B	C	0	6	3	0	6
South Side Park ...	84	B	B	B	C	C	B	B	B	C	0	6	3	0	6
Tollcross Park	61	B	B	B	B	C	B	B	B	C	0	7	2	0	1
Victoria Park	98	A	B	B	D	D	C	D	B	B	1	4	1	3	1

* See p. ii. † No records.

TABLE VII.—*Comparison of Totals of Classes A, B, C, D for Each Element of Pollution for the Two Half Years, April-September, 1917 and 1918, for 9 Stations.*

	—	—	A	B	C	D
Insoluble.	Total solids	1917	0	6	2	1
		1918	0	7	2	0
	Tar	1917	1	2	4	2
		1918	1	5	3	0
	Carbonaceous other than tar	1917	1	7	0	1
		1918	1	7	1	0
	Ash	1917	1	5	2	1
		1918	0	7	2	0
Soluble.	Loss on ignition	1917	0	6	2	1
		1918	1	6	2	0
	Ash	1917	0	6	3	0
		1918	0	8	1	0
	Sulphates	1917	0	9	0	0
		1918	1	8	0	0
	Chlorine	1917	6	3	0	0
		1918	7	2	0	0
	Ammonia	1917	0	3	5	1
		1918	1	6	1	1

TABLE VIII.—*Comparison of Totals of Classes A, B, C, D for Each Element of Pollution for the Two Half Years October-March, 1917-18, and 1918-19, for 9 Stations.*

	—	—	A	B	C	D
Insoluble.	Total solids	1917-18	0	6	3	0
		1918-19	1	4	3	1
	Tar	1917-18	1	2	4	2
		1918-19	1	6	1	1
	Carbonaceous other than tar	1917-18	2	6	1	0
		1918-19	1	6	2	0
	Ash	1917-18	0	8	1	0
		1918-19	1	7	1	0
Soluble.	Loss on ignition	1917-18	0	6	3	0
		1918-19	1	2	5	1
	Ash	1917-18	0	4	5	0
		1918-19	1	2	5	1
	Sulphates	1917-18	1	4	4	0
		1918-19	1	5	3	0
	Chlorine	1917-18	1	8	0	0
		1918-19	1	8	0	0
	Ammonia	1917-18	1	4	3	1
		1918-19	1	2	6	0

List of Stations used in Tables VII. and VIII.

London:—
Wandsworth Common.
Golden Lane.
Newcastle-on-Tyne.
Coatbridge.
Glasgow:—
Alexandra Park.
Blythswood Square.
Glasgow (*Continued*):—
Botanic Gardens.
Ruchill Park.
South Side Park.

TABLE C.—*Comparison of Deposits for 1917-18 with 1918-19.*

	—	Year.	April to Sept. (9 stations).		Oct. to March (9 stations).	
			A & B.	C & D.	A & B.	C & D.
	Total solids	1917-1918	6	3	6	3
		1918-1919	7	2	5	4
Insoluble.	Tar	1917-1918	3	6	3	6
		1918-1919	6	3	7	2
	Carbonaceous other than tar	1917-1918	8	1	8	1
		1918-1919	8	1	7	2
	Ash	1917-1918	6	3	8	1
		1918-1919	7	2	8	1
Soluble.	Loss on ignition	1917-1918	6	3	6	3
		1918-1919	7	2	3	6
	Ash	1917-1918	6	3	4	5
		1918-1919	8	1	3	6
	Sulphates	1917-1918	9	0	5	4
		1918-1919	9	0	6	3
	Chlorine	1917-1918	9	0	9	0
		1918-1919	9	0	9	0
	Ammonia	1917-1918	3	6	5	4
		1918-1919	7	2	3	6

fuel consumption, especially in domestic fires, which are known to be responsible for the greatest production of tar. The reduction in the deposit of sulphates points in the direction of reduced consumption of coal. It ought, however, to be borne in mind that for the production of an equal number of B.T.U.'s gas yields on combustion less than 1/10th of the amount of sulphurous substances yielded by coal. Account should also be taken of the fact that gas can be applied with a thermal efficiency at least twice as high as is obtainable in the case of coal, so that apart from the necessity of burning coke, the quantity of sulphates yielded by gas would be of the order of only 1/20th of that of its practical equivalent of coal. It has not been found possible to relate the deposits to the operation of the fuel rationing order, as when dealing with comparatively short periods, such as a year, the impossibility of fixing the date from which the reduction in fuel consumption might be supposed to take effect makes it impracticable. Although the date when the rationing order took effect is easily fixed, it does not follow that this coincides with a reduction in fuel consumption. Should, however, the rationing order be continued over a long period, then some useful data might be obtained, as errors due to the vagueness of the starting point would be reduced. The Coal Rationing Order became effective on Oct. 1st, 1918.

COMPARISON OF STATIONS.

In the following table (D) the highest and lowest mean monthly deposits for the year for different stations are given for each element of pollution. Rochdale heads the list with the highest deposit of total solids. It must be noted, however, that only nine months are available for this station. These may, however, be regarded as fairly representative of the year. The deposit is also probably under-estimated, since during July, August, and September the bottles overflowed and some of the water collected was lost. Since this station does not return a complete analysis, it is excluded from the comparison based on the different elements of the deposit.

TABLE D.—*Highest and Lowest Mean Monthly Deposits in 1918–19, in Tons per Square Kilometre.*

—	Highest.		Lowest.	
Total solids	Rochdale	30·28	London—Wandsworth Common	3·99
	London—Embankment Gardens	22·20	Southport—Woodvale Moss	5·98
Insoluble. Tar	Coatbridge	0·28	Wandsworth Common	0·01
	St. Helens	0·25	Southport—Hesketh Park	0·02
Insoluble. Carbonaceous other than tar	Embankment Gardens	4·49	Wandsworth Common	0·30
	Newcastle-on-Tyne	3·86	Hesketh Park	0·53
Insoluble. Ash	Newcastle-on-Tyne	7·15	Hesketh Park	0·99
	Coatbridge	6·03	Wandsworth Common	1·57
Soluble. Loss on ignition	London—Southwark Park	4·76	Wandsworth Common	0·61
	Embankment Gardens	3·90	Southport—Hesketh Park	1·42
Soluble. Ash	Embankment Gardens	7·62	Wandsworth Common	1·49
	St. Helens	7·18	London—Victoria Park	3·33
Sulphates	Southwark Park	4·28	Wandsworth Common	0·69
	Embankment Gardens	3·79	London—Victoria Park	1·49
Chlorine	St. Helens	1·90	Wandsworth Common	0·23
	Finsbury Park	0·98	Glasgow—Ruchill Park	0·26
Ammonia	Southwark Park	0·29	Wandsworth Common	0·03
	London—Golden Lane	0·23	Hesketh Park	0·04

The lowest, or second lowest, deposit is in all cases shown by Wandsworth Common, London. It will be remembered that in last year's Report Wandsworth Common was second lowest in 7 cases out of 9, the lowest being Malvern, which has made no returns during this year.

SEASONAL VARIATIONS.

In considering the seasonal variations, reference must be made to Table IX. which gives a comparison of the mean monthly deposits for the summer and winter of the year 1918–19.

Table IX. is summarised below omitting some of the doubtful figures, and referring to this summary we may now consider each element of pollution separately. (See Table E.)

Rainfall.—Out of the 25 stations, 13 showed a heavier rainfall in the winter, 11 a heavier summer fall, and in 1 station the rainfall in summer and winter was equal.

Total Solids.—19 out of 25 stations gave a greater winter deposit, while in 6 the summer deposit was the higher.

Tar.—Out of 21 stations, we find 8 with a higher winter deposit, and 13 in which the summer deposit exceeded the winter. This is a very curious state of affairs, and on reference to the Committee's last Report it will be seen that out of 16 stations considered in 1917–18, 6 showed a greater winter deposit, 6 a greater summer deposit, and n 4 the deposit was equal. It is not easy to understand why the year 1918–19 should show a greater deposit of tar in the summer than in the winter, unless due to the severity of the rationing of coal during the winter months, or dust from tarred roads during the summer.

Carbonaceous Matter other than Tar.—Out of 21 stations, 11 gave a greater winter deposit, in 1 the deposits were equal and in 9 the summer deposit was the greater. It is not to be supposed that the carbonaceous matter and tar should vary together, as the former, although it includes soot, includes also other vegetable matter.

Insoluble Ash.—In 8 out of 21 stations, the deposit in winter was the greater, and in 13 the summer deposit was the greater. This is in line with the results obtained in previous years, the summer, being the season for dust, would naturally provide a great proportion of ash in the deposit.

TABLE E.—*Comparison of Summer and Winter Deposits for the Year April, 1918, to March, 1919.*

—	Winter deposit greater in:	Deposits equal.	Summer deposits greater in:
	Stations.		Stations.
Rainfall	13*	1	11
Total solids	19*	0	6
Insoluble. Tar	8	—	13
Insoluble. Carbonaceous other than tar	11	1	9
Insoluble. Ash	8	—	13
Soluble. Loss on ignition	16	—	5
Soluble. Ash	18	—	3
Sulphates	17	—	4
Chlorine	18	—	3
Ammonia	13	1	7

* 9 Glasgow.

TABLE IX.—*Comparison of Mean Monthly Deposit for Summer and Winter Months of the Year 1918–19.*

Station.	—	Rainfall in millimetres.	Metric tons per square kilometre.									No. of months used for mean.
			Insoluble matter.			Soluble matter.		Total solids.	Included in soluble matter.			
			Tar.	Carbonaceous other than tar.	Ash.	Loss on ignition.	Ash.		Sulphates as (SO_3).	Chlorine (Cl).	Ammonia (NH_3).	
Leicester	Apl.-Sep.	61	0·18	3·33	6·10	3·62	6·62	19·85	1·83	0·62	0·22	1
	Oct.-Mch.	—	—	—	—	—	—	—	—	—	—	—
London—												
Meteorological Office	Apl.-Sep.	70	0·10	1·91	2·76	2·00	4·78	11·55	1·59	0·69	0·22	5
	Oct.-Mch.	46	0·14	1·72	4·59	1·33	3·56	10·13	1·33	0·62	0·04	4
*Embankment Gardens	Apl.-Sep.	38	0·10	1·60	2·31	2·87	5·83	12·70	2·69	0·72	0·13	5
	Oct.-Mch.	38	0·18	6·89	9·17	4·76	9·11	30·12	4·70	1·15	0·16	6
*Finsbury Park	Apl.-Sep.	51	0·06	1·59	7·86	1·69	3·34	14·55	1·45	0·37	0·07	5
	Oct.-Mch.	75	0·19	1·36	4·25	4·38	7·90	17 99	4·79	1·49	0·11	6
*Ravenscourt Park	Apl.-Sep.	57	0·07	1·74	5·10	1·75	2·89	11·54	1·35	0·40	0·16	6
	Oct.-Mch.	56	0·08	1·25	2·45	3·13	4·80	11·72	2·83	0·85	0·13	6
*Southwark Park	Apl.-Sep.	43	0·08	1·83	5·61	2·74	3·80	14·05	2·21	0·53	0·14	6
	Oct.-Mch.	46	0·13	1·83	3·98	6·79	6·70	19·46	6·35	1·05	0·45	6
Wandsworth Common	Apl.-Sep.	22	0·01	0·50	2·53	0·69	1·80	5·51	0·73	0·25	0·03	6
	Oct.-Mch.	12	—	0·04	0·14	0·49	1·05	1·73	0·63	0·20	0·02	4
Golden Lane	Apl.-Sep.	77	0·10	2·63	3·63	1·75	4·29	12·39	2·07	0·86	0·28	6
	Oct.-Mch.	57	0·09	3·24	4·08	1·68	4·47	13·57	2·11	0·84	0·18	6
Victoria Park	Apl.-Sep.	40	0·06	1·84	7·20	1·12	2·06	12·27	1·20	0·25	0·09	5
	Oct.-Mch.	32	0·03	0·95	2·27	2·11	4·91	10·29	1·86	0·40	0·05	4
Malvern	Apl.-Sep.	—	—	—	—	—	—	—	—	—	—	—
	Oct.-Mch.	39	—	0·33	1·36	0·61	2·24	4·55	0·90	0·23	0·01	1
Manchester—												
Queen's Park	Apl.-Sep.	64	—	—	—	—	—	10·30	—	—	—	2
	Oct.-Mch.	—	—	—	—	—	—	—	—	—	—	—
Whitworth Street (roof of College)	Apl.-Sep.	145	—	—	—	—	—	19·05	—	—	—	2
	Oct.-Mch.	64	—	—	—	—	—	14·30	—	—	—	3
Whitworth Street (garden)	Apl.-Sep.	98	—	—	—	—	—	15·60	—	—	—	6
	Oct.-Mch.	60	—	—	—	—	—	13·67	—	—	—	3
Newcastle-on-Tyne	Apl.-Sep.	53	0·17	3·30	6·41	1·94	4·34	16·15	2·00	0·53	0·13	6
	Oct.-Mch.	50	0·24	4·41	7·89	2·18	3·96	18·58	1·81	0·54	0·15	6
Rochdale	Apl.-Sep.	112	—	—	—	—	—	33·84	—	—	—	6
	Oct.-Mch.	144	—	—	—	—	—	23·16	—	—	—	3
*St. Helens	Apl.-Sep.	90	0·32	2·49	5·54	2·74	5·34	16·46	2·63	1·60	0·23	6
	Oct.-Mch.	83	0·20	2·22	3·73	3·71	9·20	19·08	4·63	2·21	0·05	6
Southport—												
Hesketh Park	Apl.-Sep.	90	0·02	0·37	1·48	1·58	4·18	6·63	1·67	0·67	0·08	6
	Oct.-Mch.	95	0·03	0·68	1·51	1·28	4·21	7·71	1·63	0·92	0·01	6
Woodvale Moss	Apl.-Sep.	83	—	—	—	—	—	6·33	—	—	—	6
	Oct.-Mch.	71	—	—	—	—	—	5·64	—	—	—	6
Coatbridge	Apl.-Sep.	61	0·15	2·37	6·04	2·47	4·55	15·58	2·28	0·28	0·18	6
	Oct.-Mch.	73	0·47	2·86	6·00	3·51	5·96	18·80	3·78	0·64	0·18	4
Glasgow—												
Alexandra Park	Apl.-Sep.	56	0·11	2·53	3·85	1·21	2·54	10·26	1·39	0·18	0·12	6
	Oct.-Mch.	66	0·09	2·20	3·81	2·35	4·66	13·10	2·32	0·38	0·14	6
Bellahouston Park	Apl.-Sep.	52	0·10	1·39	4·02	1·31	2·69	9·52	1·42	0·16	0·04	5
	Oct.-Mch.	79	0·04	1·57	2·69	3·30	6·15	13·75	2·99	0·38	0·10	1
Blythswood Square	Apl.-Sep.	62	0·10	1·61	3·30	1·48	2·48	8·97	1·49	0·19	0·15	6
	Oct.-Mch.	86	0·19	2·82	4·35	2·48	5·62	15·67	3·14	0·42	0·22	6
Botanic Gardens	Apl.-Sep.	72	0·17	1·73	3·97	2·58	4·03	12·48	1·83	0·20	0·07	6
	Oct.-Mch.	96	0·13	2·52	4·32	4·97	8·82	20·74	4·64	0·61	0·18	6
Richmond Park	Apl.-Sep.	50	0·13	1·49	4·14	1·94	2·93	10·64	1·63	0·26	0·12	5
	Oct.-Mch.	61	0·09	1·88	3·03	3·29	4·61	12·90	3·32	0·32	0·16	1
Ruchill Park	Apl.-Sep.	58	0·16	1·88	3·53	1·62	2·85	10·02	1·59	0·16	0·07	6
	Oct.-Mch.	92	0·11	1·79	2·63	2·37	4·65	11·56	2·79	0·36	0·17	6
South Side Park	Apl.-Sep.	69	0·11	1·13	3·02	1·79	4·03	10·07	1·64	0·22	0·07	6
	Oct.-Mch.	84	0·08	1·48	3·13	2·31	5·33	12·33	2·68	0·36	0·18	6
Tollcross Park	Apl.-Sep.	48	0·16	1·73	4·86	2·52	3·19	12·45	1·57	0·17	0·08	5
	Oct.-Mch.	61	0·08	1·76	4·33	2·10	5·00	13·27	2·95	0·38	0·16	1
Victoria Park	Apl.-Sep.	60	0·11	1·49	3·93	2·09	2·54	10·18	1·56	0·25	0·09	5
	Oct.-Mch.	98	0·04	1·29	2·55	3·95	7·88	15·71	5·44	0·55	0·13	1

* See p. ii.

TABLE X.—*Average Deposit of Each Element of Pollution for Each Month Reduced to a Standard of 30 Days for the Following Groups: (x) 9 Stations; (y) 2 London Stations; (z) 5 Glasgow Stations.*

(x) 9 Stations.

Deposit in Tons per Square Kilometre.

		1918.									1919.			Ratio Max. Min.
		April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	
	Rainfall in mm. ...	22	47	20	69	61	127	100	83	78	68	27	67	6·35
	Total solids	8·59	13·81	7·28	11·57	12·32	12·74	17·59	15·27	13·42	12·75	12·58	13·34	2·43
Insoluble.	Tar	0·10	0·20	0·15	0·08	0·12	0·06	0·12	0·12	0·11	0·12	0·26	0·11	4·33
Insoluble.	Carbonaceous other than tar ...	2·27	2·24	1·13	2·24	2·14	1·51	2·42	2·16	1·95	2·77	2·92	2·34	2·58
Insoluble.	Ash	3·64	6·05	3·08	3·61	4·23	3·13	4·40	4·78	3·76	3·38	3·85	4·38	1·96
	Total insoluble ...	6·01	8·49	4·36	5·93	6·49	4·70	6·94	7·06	5·82	6·27	7·03	6·83	1·95
Soluble.	Loss on ignition ...	0·91	2·48	0·87	1·66	1·98	2·22	3·52	2·56	2·60	1·71	2·16	2·41	4·05
Soluble.	Ash	1·67	2·86	2·05	3·98	3·85	5·82	7·13	5·65	5·00	4·77	3·39	4·10	4·27
	Total soluble ...	2·58	5·34	2·92	5·64	5·83	8·04	10·65	8·21	7·60	6·48	5·55	6·51	4·13
	Sulphates	0·91	1·49	0·98	1·92	1·87	2·65	3·29	3·27	2·49	2·56	1·90	2·45	3·62
	Chlorine	0·29	0·25	0·25	0·31	0·34	0·47	0·63	0·60	0·41	0·43	0·31	0·52	2·52
	Ammonia	0·09	0·11	0·05	0·13	0·11	0·22	0·23	0·15	0·21	0·13	0·10	0·13	4·06

(y) 2 London Stations.

Deposit in Tons per Square Kilometre.

		1918.									1919.			Ratio Max. Min.
		April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	
	Rainfall in mm. ...	48	42	19	59	44	74	30	34	53	35	35	43	3·90
	Total solids... ...	11·18	12·27	5·58	7·01	6·88	9·88	10·88	8·64	10·54	6·25	11·56	6·94	2·20
Insoluble.	Tar	0·13	0·05	0·03	0·04	0·03	0·04	0·04	0·03	0·13	0·09	9·05	0·03	4·34
Insoluble.	Carbonaceous other than tar ...	2·37	2·29	1·01	1·20	0·96	1·33	2·47	1·82	2·07	1·37	2·95	1·42	3·08
Insoluble.	Ash	3·05	6·15	1·70	2·03	1·51	3·69	3·68	2·26	2·66	1·57	3·70	1·84	4·06
	Total insoluble ...	5·55	8·49	2·74	3·27	2·50	5·06	6·19	4·11	4·86	3·03	6·70	3·29	3·40
Soluble.	Loss on ignition ...	2·05	0·92	0·92	1·21	1·04	1·07	0·97	0·96	1·68	0·96	1·42	1·39	2·23
Soluble.	Ash	3·58	2·86	1·92	2·53	3·34	3·75	3·72	3·57	4·00	2·26	3·44	2·26	2·08
	Total soluble ...	5·63	3·78	2·84	3·74	4·38	4·82	4·69	4·53	5·68	3·22	4·86	3·65	2·00
	Sulphates	1·80	1·31	0·87	1·31	1·29	1·69	1·46	1·54	1·81	1·15	1·90	1·35	2·16
	Chlorine	0·90	0·53	0·46	0·42	0·42	0·54	0·53	0·46	0·71	0·58	0·74	0·51	2·14
	Ammonia	0·24	0·14	0·09	0·16	0·08	0·21	0·12	0·10	0·10	0·10	0·13	0·09	3·00

(z) 5 Glasgow Stations.

Deposit in Tons per Square Kilometre.

		1918.									1919.			Ratio Max. Min.
		April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	
	Rainfall in mm	12	54	20	67	70	150	118	96	100	83	24	75	12·5
	Total solids	6·38	14·06	7·30	9·70	11·35	12·20	19·62	15·43	12·77	13·43	12·36	13·00	3·08
Insoluble.	Tar	0·08	0·25	0·23	0·08	0·11	0·04	0·13	0·13	0·12	0·12	0·11	0·12	6·25
Insoluble.	Carbonaceous other than tar...	2·13	2·09	1·12	2·21	1·66	1·23	2·19	1·77	1·61	2·75	2·76	1·79	2·46
Insoluble.	Ash	3·25	5·55	3·28	3·04	3·68	1·99	4·25	3·85	2·99	3·08	4·00	3·76	2·78
	Total insoluble ...	5·46	7·89	4·63	5·33	5·45	3·26	6·57	5·75	4·72	5·95	6·87	5·67	2·42
Soluble.	Loss on ignition ...	0·31	3·33	0·76	1·34	2·13	2·31	4·40	3·18	2·60	1·98	2·10	2·86	14·20
Soluble.	Ash	0·61	2·84	1·91	3·03	3·77	6·63	8·65	6·50	5·45	5·50	3·39	4·77	14·20
	Total soluble ...	0·92	6·17	2·67	4·37	5·90	8·94	13·05	9·68	8·05	7·48	5·49	7·63	14·20
	Sulphates	0·40	1·42	0·89	1·63	1·97	3·02	3·90	3·87	2·36	3·20	2·04	3·01	9·75
	Chlorine	0·06	0·14	0·13	0·15	0·32	0·33	0·58	0·66	0·35	0·31	0·14	0·44	11·00
	Ammonia	0·03	0·09	0·03	0·09	0·11	0·21	0·25	0·17	0·23	0·13	0·10	0·15	8·33

Soluble Loss on Ignition, Ash, Sulphates, Chlorine, and Ammonia all show a greater winter deposit, and this result is identical with that of the previous year.

Turning now to a consideration of the incidence of deposit during the different months of the year; for this purpose reference must be made to Table X.

This table has been prepared on similar lines to the table of the same number in last year's Report—i.e., for a group of:

(*x*) 9 stations, scattered over the country and including Glasgow and London.
(*y*) 2 London stations.
(*z*) 5 Glasgow stations.

The number of stations available for the purpose of this table has been somewhat reduced as, owing to difficulties arising from reduction of staff during the war, it has not been possible to get complete records of a reliable nature for a larger number.

Table X. has been analysed by selecting for each element of pollution the months of highest and second highest deposits; also those giving the lowest and second lowest. This analysis is given below.

Analysis of Table X. showing Months of Highest and Lowest Deposit for Each Element of Pollution.

		(*x*) 9 Stations.				(*y*) 2 London Stations.				(*z*) 5 Glasgow Stations.			
	—	Highest.	Second highest.	Lowest.	Second lowest.	Highest.	Second highest.	Lowest.	Second lowest.	Highest.	Second highest.	Lowest.	Second lowest.
	Rainfall	Sept.	Oct.	June.	April.	Sept.	July.	June.	Oct.	Sept.	Oct.	April.	June.
	Total solids ...	Oct.	Nov.	,,	,,	May.	Feb.	,,	Jan.	Oct.	Nov.	,,	,,
Insoluble.	Tar	Feb.	May.	Sept.	July.	Dec. & April.	Jan.	June, Aug., Nov., & March.	July, Sept., & Oct.	May.	June.	Sept.	April & July.
Insoluble.	Carbonaceous other than tar...	Feb.	Jan.	June.	Sept.	Feb.	Oct.	Aug.	June.	Feb.	Jan.	June.	Sept.
Insoluble.	Ash	May.	Nov.	,,	,,	May.	Feb.	,,	Jan.	May.	Oct.	Sept.	Dec.
	Total insoluble...	,,	,,	,,	,,	,,	,,	,,	June.	,,	Feb.	,,	June.
Soluble.	Loss on ignition	Oct.	Sept.	,,	April.	April.	Dec.	May & June.	Nov. & Jan.	Oct.	May	April.	,,
Soluble.	Ash	,,	,,	April.	June.	Dec.	Oct.	June.	Jan. & March.	,,	Sept.	,,	,,
Soluble.	Total soluble ...	,,	,,	,,	,,	April.	Feb.	,,	Jan.	,,	Nov.	,,	,,
	Sulphates	,,	Nov.	,,	,,	Feb.	Dec.	,,	,,	,,	,,	,,	,,
	Chlorine	,,	,,	May & June.	April.	April.	Feb.	July & Aug.	June & Nov.	Nov.	Oct.	,,	,,
	Ammonia	,,	Sept.	June.	,,	,,	July.	Aug.	May & March.	Oct.	Dec.	April & June.	May & July.

In considering this analysis it is important to note that group *x* includes under it the stations shown in groups *y* and *z*, so that it will not be advisable at present to compare group *x* with *y* or *z*, and in what follows attention will be confined to a comparison of the London and Glasgow stations only.

Taking each element of deposit as shown on this analysis, we find that the incidence was as follows:—

Rainfall.—In both Glasgow and London the highest rainfall occurred in September and the lowest in June or April. It is noticeable, however, that while in the London stations the second lowest rainfall was registered in October, in the group of Glasgow stations October showed the second highest rainfall during the year.

Total Solids.—In London the highest deposit of total solids was registered in May, the lowest in June; whereas in Glasgow the highest deposit was in October and the lowest in April.

Tar.—In London the maximum deposit of tar occurred in December and April, the lowest in June, August, November, and March. In Glasgow, May showed the highest deposit, September the lowest. This may be regarded as fairly normal for London, but presents certain anomalies; for example, we find a maximum in April and a minimum in November, whereas it might be expected that tar would make its maximum deposit during the months when domestic fires were most required. The carriage by the wind of dust from the surfaces of tarred roads may provide some of the tar noted, and this source would naturally be most productive in the summer; possibly it has something to do with the anomalous distribution referred to.

Insoluble Carbonaceous Matter.—In both groups *y* and *z* the maximum deposit occurs in February, while the lowest, or second lowest, is found in June. Here, again, we find no relation between the deposit of carbonaceous matter and of tar, which is doubtless explainable on the basis that they differ in their sources, as already pointed out. While tar is probably derived mainly from the products of combustion, carbonaceous matter is partly derived from the same sources, but also from wind-blown organic vegetable matter.

Insoluble Ash.—This deposit follows the lines indicated by practically all previous observations—i.e., it makes its highest deposit in May in both groups and its lowest in August or September. It is curious, however, to observe that a second maximum occurs in February in London with a minimum in January, while in Glasgow the second maximum occurs in October and the second mini-

mum in December. We have already pointed out that insoluble ash is largely derived from wind-blown dust, which is naturally a summer product. It must also be remembered that an important source is ash and grit carried up the chimney-stacks from boiler and other furnaces. This source should, however, provide a comparatively uniform amount each month and will hardly explain the distribution. If, however, we compare the incidence of deposit of insoluble ash with rainfall, it is noticeable that in London the highest rainfall was in September, the lowest ash deposit in August. The lowest rainfall was in June, the highest ash in May. This is not exactly an inverse relationship, but it points distinctly in that direction. Referring to Group *z*, the highest rainfall is in September, the lowest ash is also in September. Again, the lowest rainfall is in April and the highest ash deposit May, still pointing towards the inverse relationship already indicated in previous reports.

Considering now the total of insoluble matter. This makes its highest in both groups in May and its lowest in both in either August or September, the second lowest in each case being in June. There is no relationship detectable here between the rainfall and the deposit of insoluble matter.

Soluble Loss on Ignition.—In London the highest deposit was in April, whereas in Glasgow the lowest deposit was in April.

Soluble Ash made its maximum deposit in London in December, its minimum in June, while in Glasgow the maximum was in October and the minimum in April. There was, however, a second minimum in June.

Total Soluble Matter.—Considering this together with the rainfall, we find the highest deposit in London in April, which does not correspond with the highest rainfall. The lowest deposit of soluble matter was in June, corresponding with the lowest rainfall. In Glasgow the highest deposit was in October and the lowest in April, corresponding fairly with the months of highest and lowest rainfall.

Sulphates, Chlorine, and Ammonia.—As these are included under total soluble, the distribution will naturally be somewhat similar. Sulphates show a maximum in the winter and a minimum in the summer months in both groups, corresponding with the periods of maximum and minimum use of domestic fires. Chlorine gave its maximum deposit in London in April, whereas the same month showed a minimum deposit in Glasgow. The same remark applies to ammonia.

Relation of Deposits.

Curves have been plotted, as in previous Reports bringing out the relationship of the different deposits to each other; these are shown in Figs. 1 and 2. Referring first to the relationship between rainfall and the deposit of soluble atmospheric impurities, the curves in Fig. 2 have been plotted from the figures shown for the groups *x*, *y*, *z* of Table X., and a straight line, A B, on the curve has been drawn through the points, as in the last Report. In considering this curve it must be remembered that the group *x* includes *y* and *z* and cannot be regarded as showing independent observations. The line A B, however, is fairly correct for the groups *x* and *z*, while possibly group *y* would be better represented by a line of less slope.

On working out an equation to the line A B, as in last year's Report, and calling the rainfall "R," the deposit of soluble matter "S," we get the following result:—

$$S = 0{\cdot}069\,R + 2.$$

Referring to the last Report the equation of the line for 1917–18 was—

$$S = 0{\cdot}058\,R + 2{\cdot}5.$$

While not identical, these are sufficiently alike to indicate that the expression is fairly representative of the relationship between rainfall and soluble deposit. It will be remembered that in last year's Report the formulæ for 1915–16 and 1916–17 were also given and were of the same type. The logical inference to be drawn apparently is that while we may expect a small and fairly constant deposit of soluble matter during dry weather, this is rapidly increased by rainfall, the increase being roughly directly proportional to the amount of rain.

Referring now to Fig. 1, the curves there shown are intended to bring out the relationship of the different deposits to each other. The left hand lower set of curves for the soluble matter and rainfall shows very clearly the existence of a

TABLE XI.—*Average Deposit Each Element of Pollution for Each Month Reduced to a Standard of 30 Days for Group of 9 Stations for Four Years, April, 1915–March, 1919.*

		1915–1919.											Ratio Max. / Min.
		April.	May.	June.	July.	August.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March.	
	Rainfall in mm. ...	41	61	44	74	71	55	88	78	80	71	58	48	2·12
	Total solids	11·78	13·74	12·45	11·34	12·87	10·76	16·79	14·80	15·85	13·45	13·50	12·68	1·56
Insoluble.	Tar	0·12	0·15	0·19	0·17	0·11	0·11	0·12	0·13	0·24	0·17	0·19	0·11	2·18
Insoluble.	Carbonaceous other than tar ...	2·39	2·08	1·98	2·00	2·02	1·72	2·67	2·29	2·11	2·25	2·24	2·18	1·55
Insoluble.	Ash	4·51	4·98	5·09	3·55	4·58	3·58	4·38	4·50	4·00	3·68	4·08	4·26	1·43
	Total insoluble ...	7·02	7·21	7·26	5·72	6·71	5·41	7·17	6·92	6·35	6·10	6·51	6·55	1·34
Soluble.	Loss on ignition ...	1·64	2·21	2·01	1·91	2·16	1·57	3·39	2·77	3·08	2·43	2·42	2·16	2·16
Soluble.	Ash	3·12	4·32	3·18	3·71	4·00	3·78	6·23	5·01	6·42	4·92	4·57	3·97	2·06
	Total soluble ...	4·76	6·53	5·19	5·62	6·16	5·35	9·62	7·88	9·50	7·35	6·99	6·13	2·02
	Sulphates	2·24	2·36	1·65	1·99	2·40	1·65	3·12	2·92	3·25	2·44	2·53	2·05	1·97
	Chlorine...	0·40	0·29	0·23	0·24	0·47	0·27	0·75	0·59	0·50	0·80	0·68	0·47	3·48
	Ammonia	0·12	0·15	0·12	0·14	0·15	0·12	0·19	0·15	0·14	0·14	0·15	0·13	1·58

1918–19.

FIG. 1.—CURVES OF AVERAGE DEPOSIT OF EACH ELEMENT OF POLLUTION FOR EACH MONTH FOR GROUP OF NINE STATIONS.

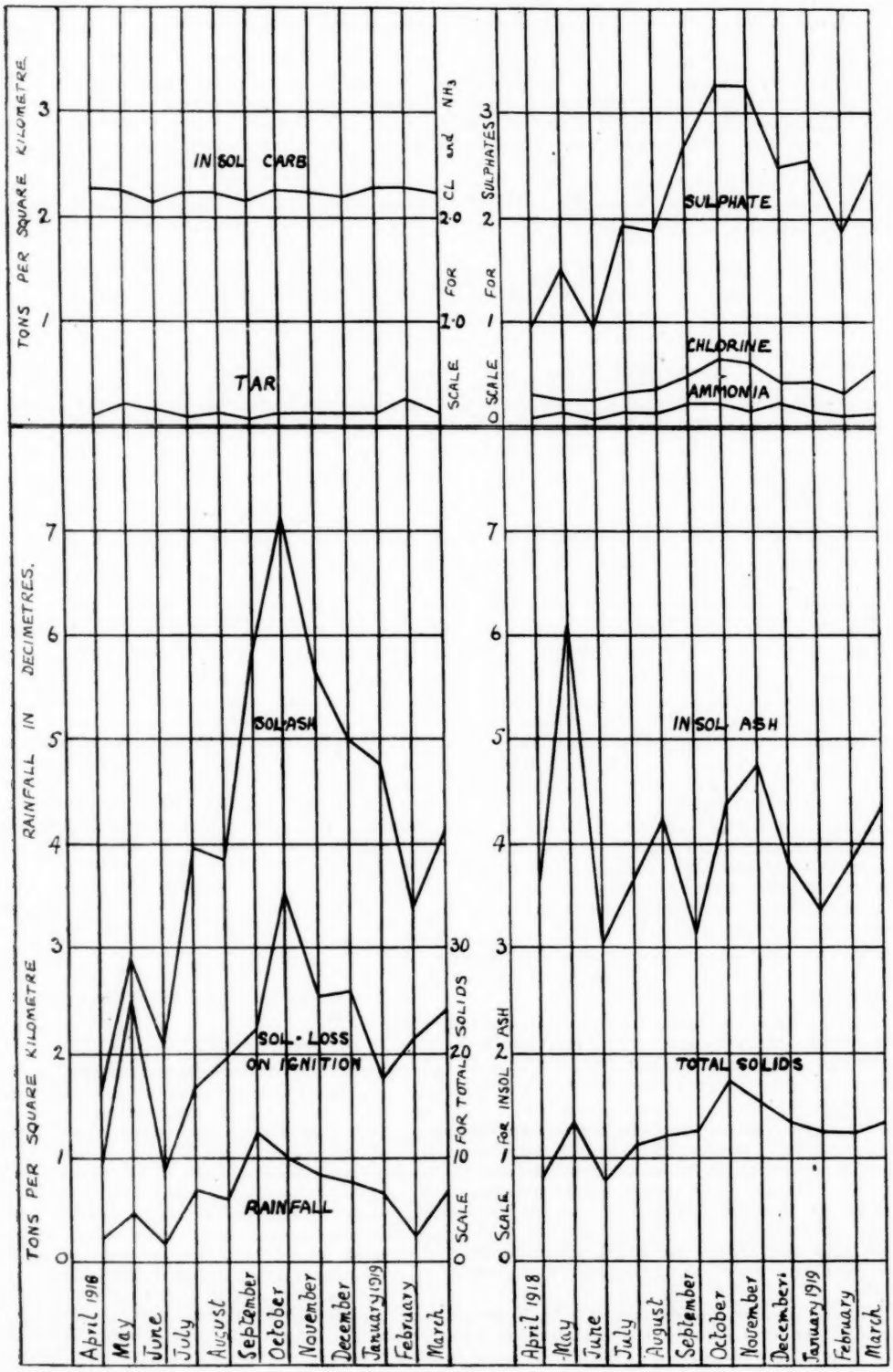
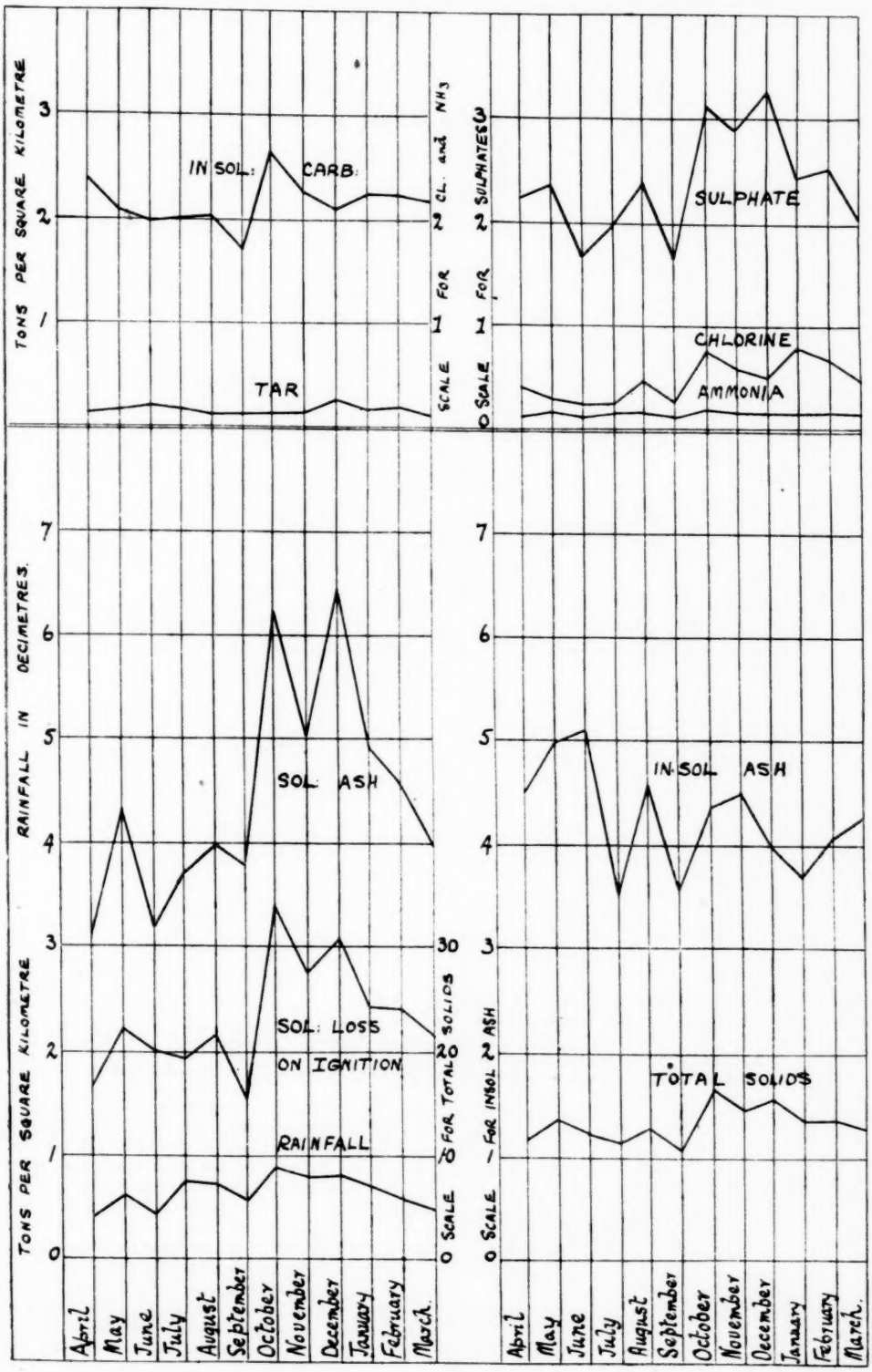


FIG. 1A.—CURVES OF AVERAGE DEPOSIT OF EACH ELEMENT OF POLLUTION FOR EACH MONTH FOR GROUP OF NINE STATIONS FOR FOUR YEARS, APRIL, 1915–MARCH, 1919.



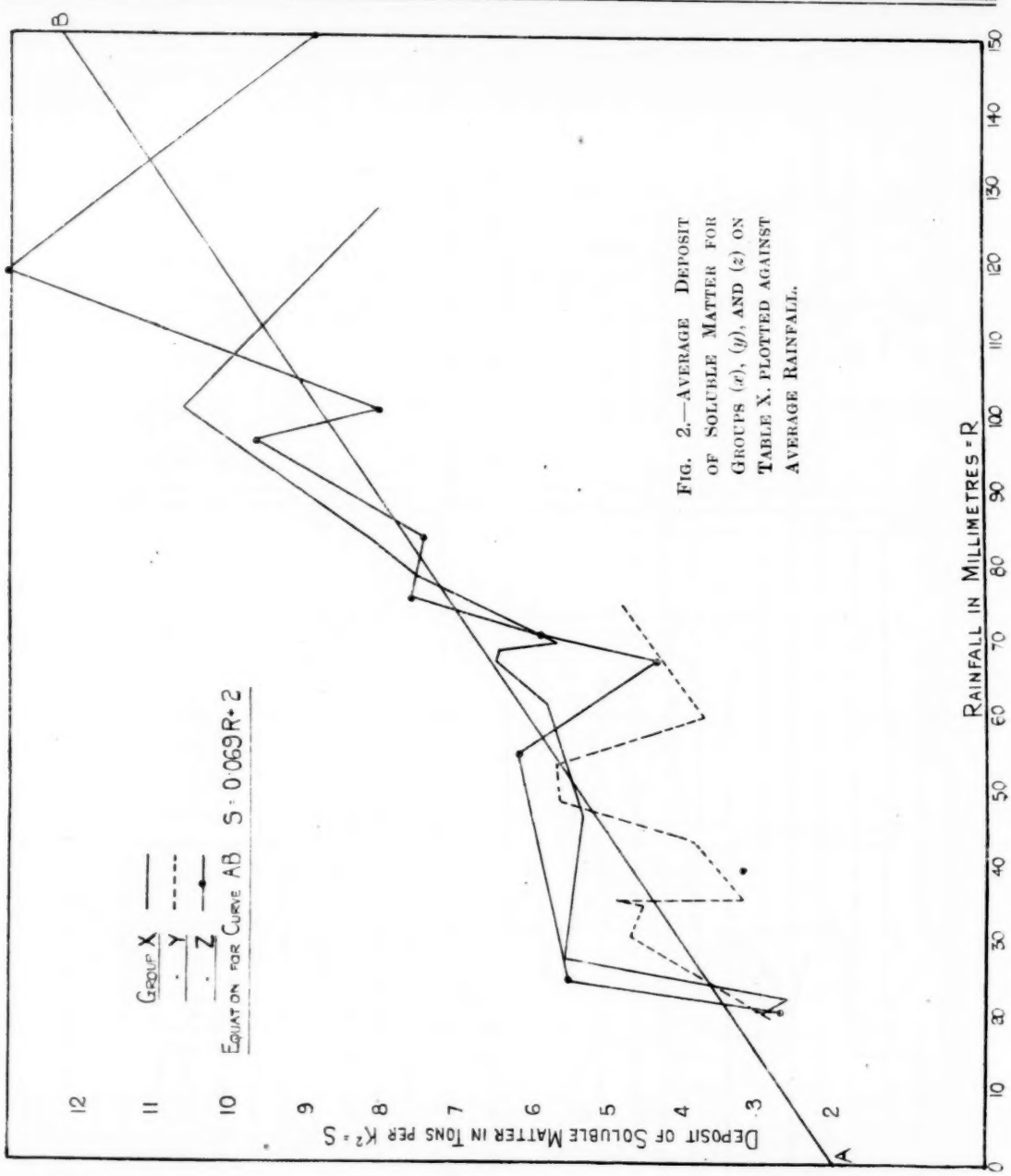


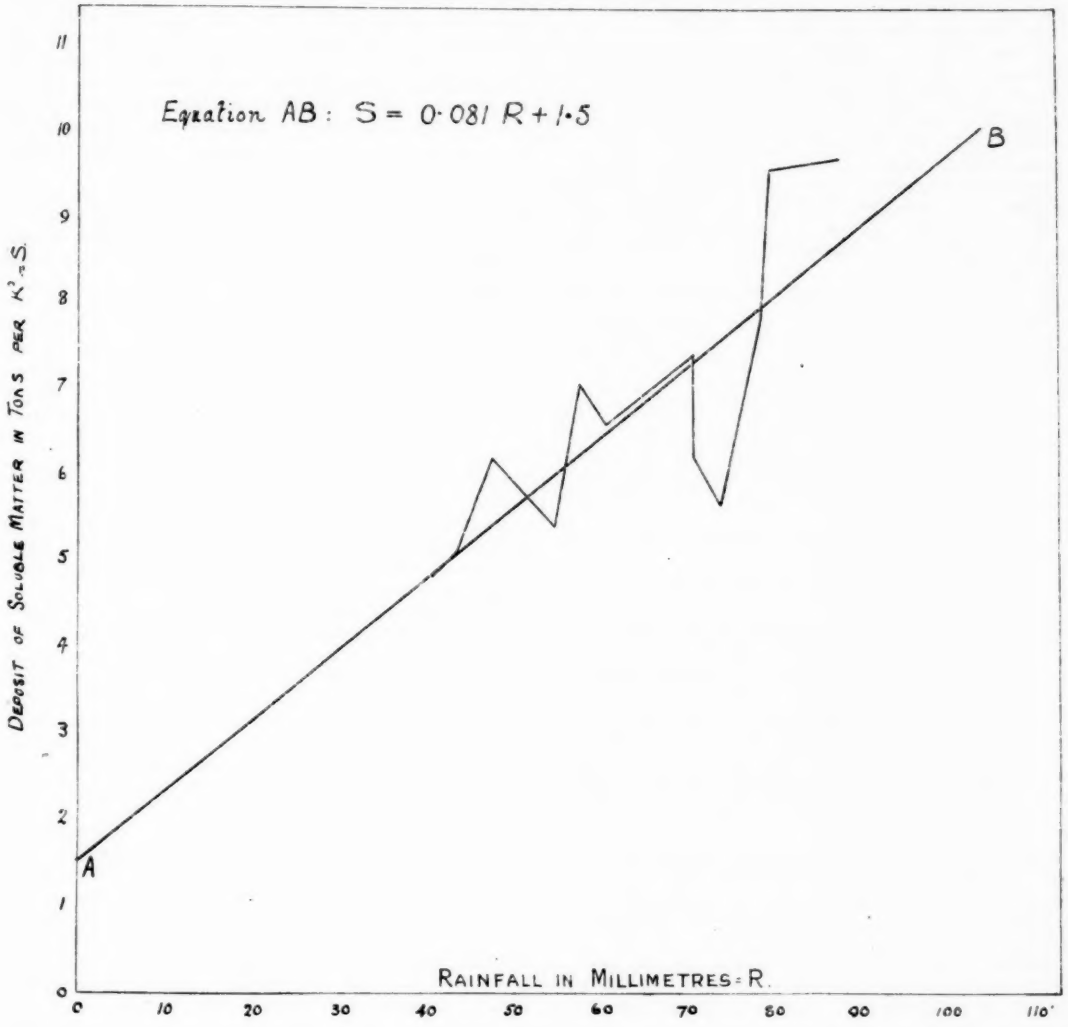
FIG. 2.—AVERAGE DEPOSIT OF SOLUBLE MATTER FOR GROUPS (*x*), (*y*), AND (*z*) ON TABLE X. PLOTTED AGAINST AVERAGE RAINFALL.

relationship between them. This relationship again appears in the top right hand set of curves for some of the constituents of the soluble deposit. On the other hand, total solids, which represents both soluble and insoluble matter, has its relationship to the rainfall influenced by its soluble contents, and, therefore, varies to some extent with the rainfall. Insoluble ash gives a curve which is indicative of an inverse relation to the rainfall, as is to be expected. The months of maximum and minimum deposit are also brought out clearly in this set of curves.

Tables and curves have been prepared for a group of four years. Table XI. and Figs. 1A and 2A show the results. It was not possible to get at present a complete quinquennial period owing to the necessity for using the same stations for the whole period. A group of nine stations was selected which gave continuous records over the whole period of four years. These are the same stations shown in group *x*, Table X. Referring now to the curves, Fig. 1A and Table XI., and observing the months of maximum and minimum deposit, we get the results shown below.

It is curious how many of the elements of deposit make their maximum in October and minimum in September. Insoluble ash is the only one with a summer maximum, while in all cases the minimum occurs between April and September.

FIG. 2A.—AVERAGE DEPOSIT OF SOLUBLE MATTER FOR GROUP X. ON TABLE XI. PLOTTED AGAINST AVERAGE RAINFALL FOR FOUR YEARS, APRIL, 1915–MARCH, 1919.



	Maximum deposit.		*Minimum deposit.*
Rainfall	October	.....	April.
Total solids	,,	.....	September.
Tar	December	.....	Aug., Sept., March.
Carbonaceous insoluble ...	October	.....	September.
Insoluble ash	June	.....	July.
Total insoluble	,,	.....	September.
Soluble loss on ignition ..	October	.....	,,
Soluble ash	December	.....	April.
Total soluble	October	.....	,,
Sulphates	December	.....	Sept., June.
Chlorine	January	.....	June.
Ammonia	October	.....	April, June, Sept.

Fig. 2A is of a special interest, as it shows the relation between soluble deposit and rainfall. In the four years' result, using the same notation as before, the relationship is expressed by the equation:—

$$S = 0{\cdot}081\ R + 1{\cdot}5.$$

The curve is very irregular and does not seem to approach the straight line any nearer than that shown in Fig. 2. The relationship indicated by both Figs. 2 and 2A—i.e., that the soluble deposit is equal to some function of the rainfall plus a constant—would naturally be obscured by variations in the amount of soluble matter contained by the air; it could only be under special circumstances, such as when the production of soluble impurity was constant throughout the whole period considered, that we could expect to find an exact relation between the soluble matter and the rainfall. It is obvious that, however effective the rain may be in bringing down soluble matter, the amount brought down must also be some function of the amount present in the air, and so the curves shown in Figs. 2 and 2A could never be expected to show anything more than approximation to a definite relationship. Strictly speaking, the line A B must be some form of curve which approaches a limiting value, as the supply of soluble impurity in the air becomes reduced by its removal; its length is, however, too short to give any indication of this.

EXPERIMENTAL WORK.

There are several problems in connexion with the pollution of the air which the Committee felt could only be adequately dealt with by the careful and undivided attention of a skilled physical chemist. Much research was needed in dealing with these problems, and the Committee, therefore, secured the services of Mr. G. M. Watson, B.Sc., A.R.C.S., who has carried out the work described below, under the general direction of the Chemical Subcommittee, which consisted of the following members: J. G. Clark, Esq., F.I.C., Dr. E. J. Russell, S. A. Vasey, Esq., F.C.S., F. J. W. Whipple, Esq., W. S. Curphey, Esq., Professor H. B. Baker, F.R.S., Professor W. H. Gee.

The more important questions requiring investigation were considered, and a scheme of research drawn up indicating the lines which might be followed. The chief aspects which it was decided to investigate were as follows:—

(1) The acidity of the air, making the attempt to separate the acidity which existed in the form of free gas and that which was held by the suspended matter of the air.
(2) Vertical distribution of suspended impurities.
(3) The relation between bacterial and smoke contents of the air.
(4) Pollution by motor as compared with horse traffic.
(5) Microscopic examination of the impurities suspended in the air, particularly with a view to measurement of size of particles and the distance from their source to which different sized particles are carried.
(6) The selective action of rain or snow in bringing down certain constituents of suspended impurity in preference to others.
(7) The effect of suspended impurity in obstructing light.

It was decided to commence work on the measurement of acidity, as being one of the most important points, and, if possible, to run concurrently with this an examination into the vertical distribution of suspended matter.

The automatic filter which was described at the end of the last Report has been in the hands of the instrument makers for several months, but owing to the difficulty in procuring a suitable clock it has not been possible to complete the apparatus, hence there is still only the single experimental instrument in use.

VERTICAL DISTRIBUTION.

A great deal of time has been spent on the subject of vertical distribution of suspended impurities in the atmosphere, but no conclusive results have been obtained, mainly on account of the smallness of the amount of dirt at any altitude tested. The whole question has been treated in a very simple manner.

The automatic air filter was set up at the back of the Royal College of Science on the ground level. Simple spot records were taken with the two-bottle single record apparatus at different altitudes almost vertically above this, and these were compared with the shade obtained at the same time by means of the automatic filter.

Several observations were made at the top of the tower of the Imperial Institute, which stands very close to where the automatic filter was placed. Others were taken on the roof of the Royal College of Science, at an altitude of 80 feet. The height of the Imperial Institute Tower is 200 feet. These observations were made in May, 1919.

In no case was there any marked difference between the corresponding records. On only one occasion was there any fog, and, in this case, the shade was slightly darker at 80 feet than on ground level. The shade at 200 feet was the same as on the ground level, but it must be noted that whereas this was taken when the fog was constant, the one at 80 feet was taken later in the day, when the fog was rapidly clearing away. Several results, which should be much more reliable, were obtained in a similar way, but using two 15 litre aspirators, which produced records much easier to compare than the smaller scale apparatus. One of these sets of two large bottles was placed outside the R.C.S., and the other set was arranged on the roof of the New Science Building, almost vertically above it. Each apparatus took a spot record on paper, one-eighth of an inch in diameter. In every case the shade reached was three on the standard scale, both on the roof which was at an altitude of about 120 feet, and on ground level, but the lower one seemed very slightly the darker of the two. Weather conditions during the four days in which these observations were made, remained very constant, an anti-cyclone prevailing, and the wind being steady in the East. The amount of suspended matter was very small at either altitude.

The question of suspended impurity is closely connected with weather conditions, especially fog, which is known to show a maximum density, sometimes low and sometimes at high altitudes, and consequently no conclusions can be drawn from a few isolated experiments such as have been carried out to date. The investigation of the problem of vertical distribution will be continued in the future under as varied conditions as possible.

On the question of acidity, some experimental work had already been carried out by Professor Gee, of the Advisory Committee, at Manchester. The method which he employed was to draw, at the rate of 4 cubic feet per hour, a volume of air measured by means of an ordinary gas meter through a series of absorption tubes containing distilled water, and to estimate the acidity developed in the water. The absorption apparatus consisted of three Strohmeyer tubes, a sketch of one of which is appended (Fig. 3), and it was found that whereas the water in the first tube became distinctly acid, and that in the second slightly so, the third remained quite neutral, showing that, even at this rapid rate of passing the air, distilled water was a quite effective agent in washing out the acid.

Alkalinity of Glass.

Professor Gee recommends the use of silica apparatus to overcome the difficulty of alkalinity of ordinary glass, which, when one is dealing with the excessively small quantities of acid such as are found in volumes of air capable of easy manipulation, would possibly lead to considerable experimental errors. This, however, may not be necessary, for in all the experiments referred to here glass apparatus was used, and in no case was the indicator, which had been just made to change, brought back to its original colour by the glass, even after standing for two or three days. Moreover, there are means of reducing the alkalinity of glass to an inappreciable amount, such as washing with 1 per cent. hydrofluoric acid, steaming, &c.

The problem of the acidity of the atmosphere divides itself naturally into two main headings, viz.:—

(*a*) Acidity due to suspended matter;

(*b*) That due to gaseous impurities;

and it was decided to treat these two groups separately if possible.

The case of carbon dioxide is rather exceptional, and it was decided that it should not be estimated with the rest of the acids, since its effects upon buildings, &c., are negligible.

Combined Acids.

Acids in the form of salts would probably be encountered in the atmosphere, and as in this form they would be largely detrimental to buildings combined acids should be estimated as well as the free.

The kinds of acids likely to be found may be predicted. The chief suspended ones would presumably be sulphuric and nitric acids, and the gaseous would be mainly sulphur dioxide. Chlorides would also be likely impurities.

The chief experimental difficulty which presented itself was due to the minuteness of the quantities of acid present in any reasonably small volume of air, and the volume was necessarily limited by considerations of time. It was not sufficient to obtain an average result over a large interval of time, because atmospheric conditions vary considerably and with great rapidity, and much of the value of the present research would lie in determining the relationship between these conditions and the amount of acid present in the air, hence the experiments must be carried out quickly and the sensitiveness of the method employed should be such that an observation may be made upon a volume of air which is capable of being passed through the apparatus in a few minutes.

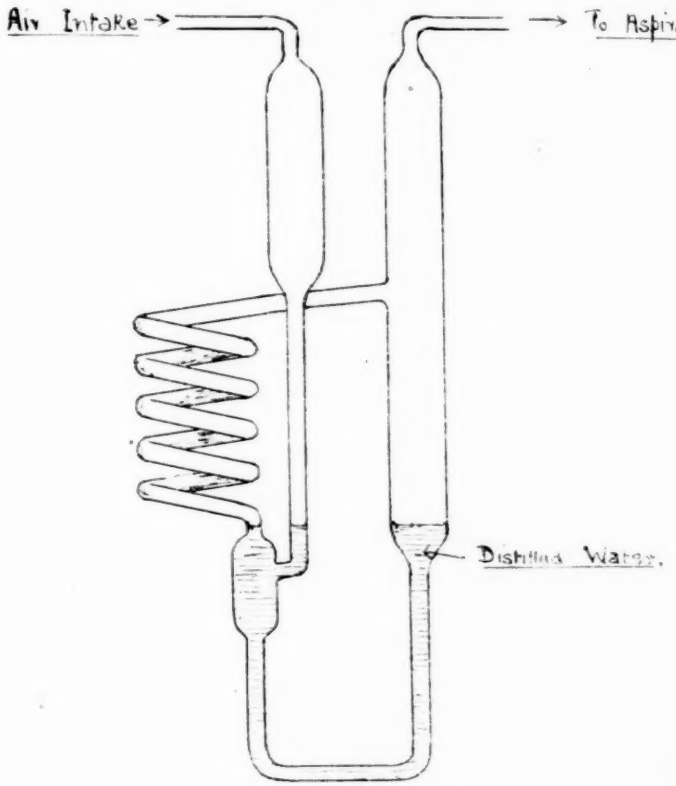
With these objects in view, the research work was commenced, and the following is a brief report of what has been done to the present date.

Preliminary Work.

It was known as a result of Professor Gee's work that under certain conditions water would absorb the acid from the air, and it was thought possible that a solution of an indicator might be made slightly alkaline and used in place of pure water, so that it would only be necessary to determine what volume of air was required to bring about a colour change in such a solution to obtain a direct and quantitative result as to the free acid in the air, which was absorbed by the water. It does not necessarily follow because two Strohmeyer tubes will apparently take the whole of the acid from the air, that the water collects all the impurities, or even all the free acid present. This subject is referred to later.

If this method could be employed it would obviously be advantageous to reduce the quantity of indicator solution to an absolute minimum, and this led to the first experiment which was to determine how such a solution might be employed. The indicator should preferably be insensitive to carbon dioxide, and for this reason methyl-orange was

FIG. 3.—STROHMEYER TUBE.

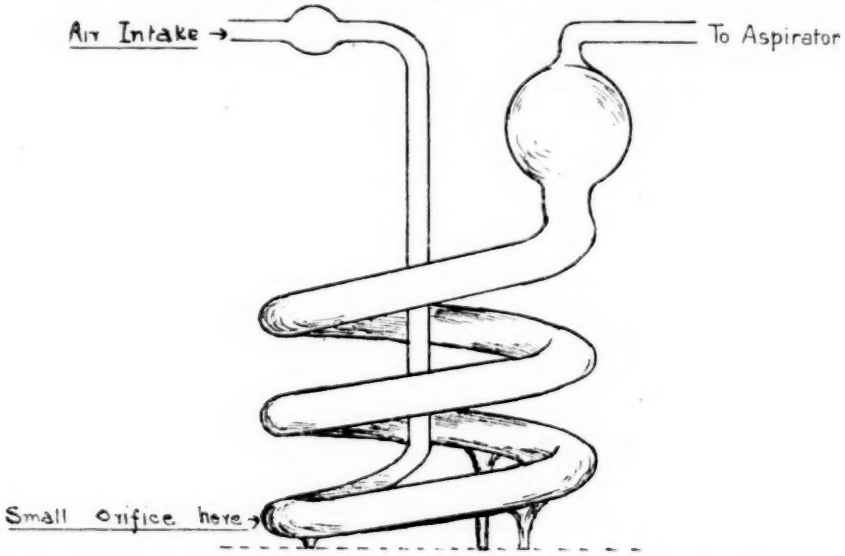


selected. Methyl-orange is an indicator which in the presence of an alkali gives a yellow solution, which changes to red on the addition of free acid in sufficient quantity. It is unaffected by the presence of carbonic acid. A solution of the dye was made up in distilled water, rather more concentrated than is generally used as indicator. Strohmeyer tubes were found to be unobtainable, and since the actual absorbing portion consists of a spiral glass tube the nearest approach to this was sought, and some Winkler absorption tubes, as shown on sketch appended, were procured (Fig. 4). Air was aspirated through these tubes by means of two Winchester quart bottles, and later by means of a large eight-litre aspirator. Three tubes were connected in series and through these the air was passed. It was found that air could be drawn at the rate of eight litres in

Indicators.

Other indicators tried were erythrosin (iod-eosin), and methyl-red, both used in a similar manner to that described above. Of these, the former was abandoned because a definite end-point can only be obtained when ether or chloroform is present, and methyl-red was found to be useless because it was sensitive to carbon dioxide, a property which is not shared by methyl-orange. It was concluded that methyl-orange was the most suitable indicator for the present purpose. Experiments with solutions of different concentrations were made, with a view to finding the best strength. When the solution was very dilute it was difficult to judge the colour in the narrow diameter of the Winkler tube, and so it was preferable to make use of a fairly strong solution.

FIG. 4.—WINKLER TUBE.



five minutes, when if 1·5 c.cm. of liquid were present in each tube, the sides were kept moistened throughout the whole length of the spiral. The methyl-orange sold as indicator is the sodium salt of the dye, and this is what was present in the solution made up. Consequently the addition of alkali was superfluous, as the addition of an infinitely small amount of acid to the solution should begin to produce a change of colour. The sensitiveness of the indicator was tested by adding a very minute quantity of dilute sulphuric acid, which produced a perfectly definite colour change. It was found that under the conditions named above, a change of colour was soon produced in the first tube, but apparently no trace escaped through to the second. An attempt to diminish the quantity of indicator was made as follows:—

A piece of paper as used in the Owens filter was soaked in methyl-orange solution, and when nearly dry, a filter record was made in the usual way. No colour change was detectible. The same was repeated with damp litmus paper, when a red patch was obtained, no doubt due to carbon dioxide. The paper became coated with a deposit of soot, and this method was abandoned as the the deposit obscured the colour change.

EXPERIMENTAL MEASURES.

An attempt was next made to determine the relative importance of the suspended and gaseous acids in the air by measuring the volume required to produce a change of colour in the 1·5 c.cm. of solution in a Winkler tube, and then repeating with air which had been passed through a fairly large disc of the paper such as is used in the Owens filter. Later, the two determinations were run simultaneously. It was found in all cases that a greater volume of filtered air was required than unfiltered to produce a similar change in the tubes, and the ratio of gaseous to suspended acid calculated from these data was found to vary from 2 : 1 to 16 : 3. The phenomenon may be genuine, but it is most probably due to absorption of gaseous acid by the filter-paper. which was not perfectly dry and was distinctly alkaline to methyl-orange solution. The particles of carbon collected on the paper may also contribute to the difference by effects of adsorption. The fact that air which had passed through an absorption-tube still gave a discolouration to a filter-paper, about as marked as air which had not undergone the same treatment, showed that the suspended matter could be producing little or no effect in the absorption-tube

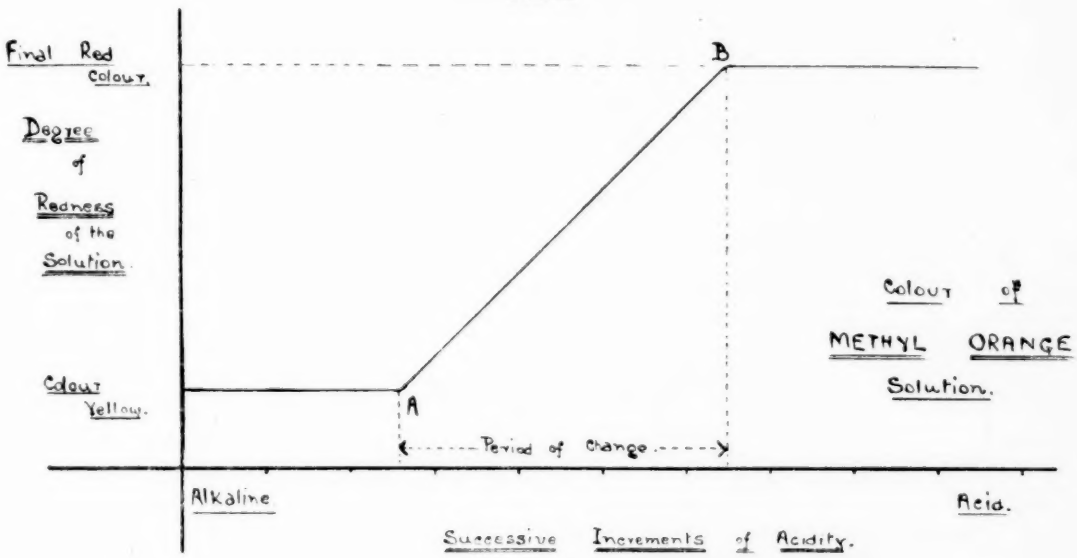
even when not filtered out. This points to the above ratio being fictitious. Before any conclusion could be drawn from the experiments a means of detecting when the methyl-orange solution began to change in colour had to be found. Moreover, when the change had begun considerable time elapsed before it was completed, when a series of shades from yellow to rose-pink were passed through. If some means of expressing the degree of redness of the solution could be developed the results would be far more comparable, and there seemed a possibility of its leading to a method of obtaining quantitative results for the following reason:—

The solution begins yellow and becomes red. If this is expressed in a graph, as Fig. 5 appended, the degree of redness being plotted vertically, and small successive increments of acidity on the horizontal axis, the graph obtained would presumably be of the type drawn, when, if a standard

(*c*) Spectroscopic means were also tried. Solutions which were yellow, red, and intermediate colours were placed in parallel-sided glass vessels, and observations of the absorption band in the blue end of the spectrum were made. As the degree of redness increased, the end of the band certainly showed a measurable shift, but the results were rendered unreliable by the ill-defined nature of the end of the band.

(*d*) A photographic method was tried. Exposures were made on pieces of gas-light printing paper through yellow and red solutions respectively. A standard development was given, when the paper which had received the exposure through the red solution was appreciably darker than that through the yellow, but the difference was not considered to be great enough to justify further experiment along this line.

FIG. 5.



solution of methyl-orange were made up, and the degree of redness could be expressed in figures, the increment of acidity producing a definite colour change could be estimated, provided that the range of the whole experiment lay on the sloping part of the line.

COMMENCEMENT OF COLOUR CHANGE.

Various methods of determining the point when the colour change began were tested.

(*a*) The method employed in all the experiments referred to above was inspection in ordinary light. A check tube was filled with the same solution as the one used for absorption, and it was retained as a standard of comparison.

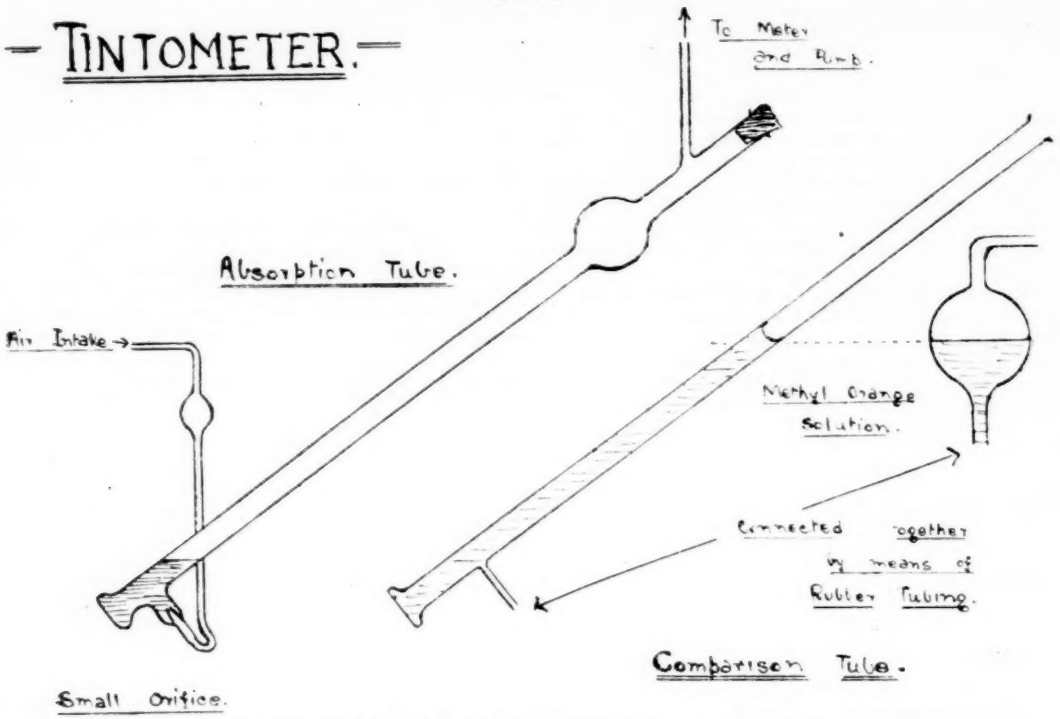
From this point, by kind permission of Professor H. B. Baker, the work which had previously been carried out at the Committee's office was transferred to the Royal College of Science, South Kensington, where various appliances, such as filter pump, gas meter, and spectroscope, were available for use.

(*b*) Inspection in monochromatic light was also tried under the same conditions. Sodium yellow light and various coloured screens, made in some cases by taking a solution of a dye in a parallel-

(*e*) A new method which appeared to promise better results was then tried. It was noticed that when a tube containing yellow methyl-orange solution was looked at end on, so as to see a thick layer of solution, the colour was apparently identical with that of a thin layer of red solution. A tintometer was therefore constructed on the following lines:—

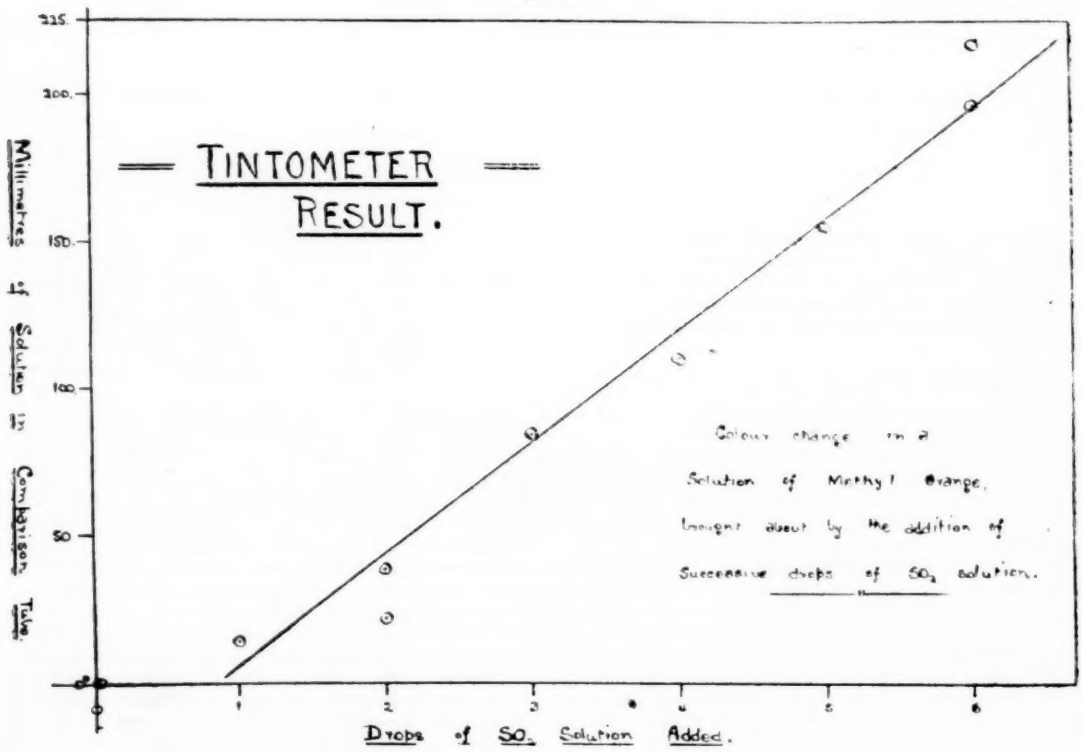
An absorption tube, very similar to a Winkler tube, was made, but the whole length was straight. The lower end terminated in a flattened bulb, and the upper was closed by means of a cork. (Fig. 6.) When the cork was in position air could be drawn through a small quantity of methyl-orange solution contained in the tube, and absorption carried on as usual. When the cork was withdrawn the solution could be seen down the length of the tube. A comparison tube was made on a similar principle, and a side bulb containing yellow methyl-orange solution was fitted, so that the level of solution inside the tube could be raised or lowered at will. This was clamped at the side of the absorption tube, and it was found that as the colour of the solution in this changed, due to the acid derived from the air, the colour in the comparison tube

FIG. 6.



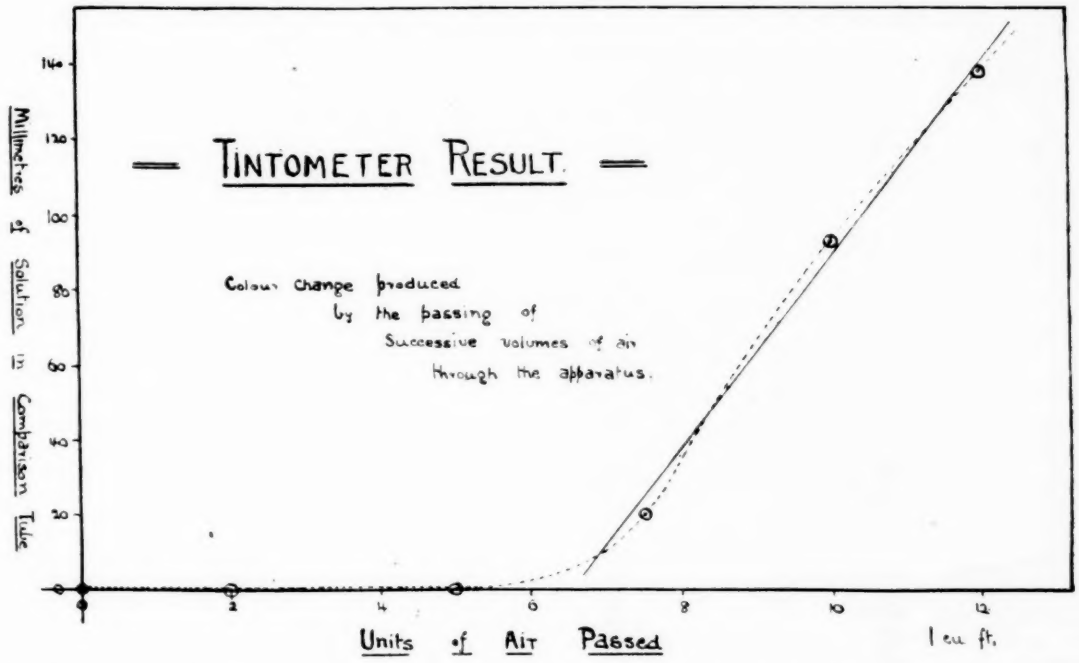
When in use the two tubes are placed side by side, and are made to point towards the same illuminant.

FIG. 7.



could be made the same by raising the level of the solution in it. Successive small quantities of air were passed through the absorption tube, and after each the colours were matched and the heights of solution in the standard tube above what it was originally were measured. These were plotted on the ordinates of a graph, and the volumes as abscissæ. (Fig. 8.) The curves gave distinct indications that there was a little alkalinity in the methyl-orange solution, presumably dissolved from the glass vessels in which the solution had been kept for weeks, or from the bottles in which the distilled water was kept, and when this was overcome the change in height of liquid in the comparison tube was directly proportional to the amount of acid added. This was borne out also by the increasing thickness in the layer of solution contained in the comparison tube and probably due to effects of reflection and refraction. An arrangement for varying the intensity of illumination without introducing any colour effects was devised and made, in which the two tubes were arranged to point towards similar sheets of white paper illuminated indirectly by the same electric light through the medium of two mirrors arranged in such a manner that the path of the rays could be lengthened or shortened at will. Both mirrors were mounted on the same sliding-piece, so that as the intensity of illumination on one sheet of paper was increased, that on the other was automatically decreased. Later, a larger tintometer, sketched in Fig. 9, was constructed, the object of

FIG. 8.



results of an experiment in which drops of very dilute sulphurous acid were added to the indicator instead of passing air through it. (See Fig. 7.)

FINAL METHOD EVOLVED.

Several defects of the first apparatus were discovered, and so another was constructed to remedy them. In the second apparatus, which represented at that stage the final method evolved, the air inlet in the absorption tube was at the side of the flattened bulb, so that no part of the solution was allowed to remain stagnant, as possibly may have happened in the first one.

An eye-piece consisting of an arrangement of four mirrors was constructed, so that the field, in the form of a disc, was divided into two equal parts, illuminated respectively by light which had passed through the two tubes. It was hoped that by this means it would be easier to obtain a comparison than when the tubes were placed side by side. A point which introduced a good deal of difficulty in the matching of the colours was the alteration in intensity of the light transmitted, accompanying an increasing the size being two-fold. It was possible to pass the air through the absorption tube at a much greater rate than before, and yet have it broken up into small bubbles and thoroughly agitated with the solution, of which there was a much greater volume than in the former apparatus. With the increased diameter of the tubes the colour could be judged more easily, and the eye-piece and arrangement for varying the intensity of the light were dispensed with. The method of using this apparatus is given below, reference being made to Fig. 9.

The complete apparatus consists of two main portions, viz.:—

(*a*) The absorption tube.

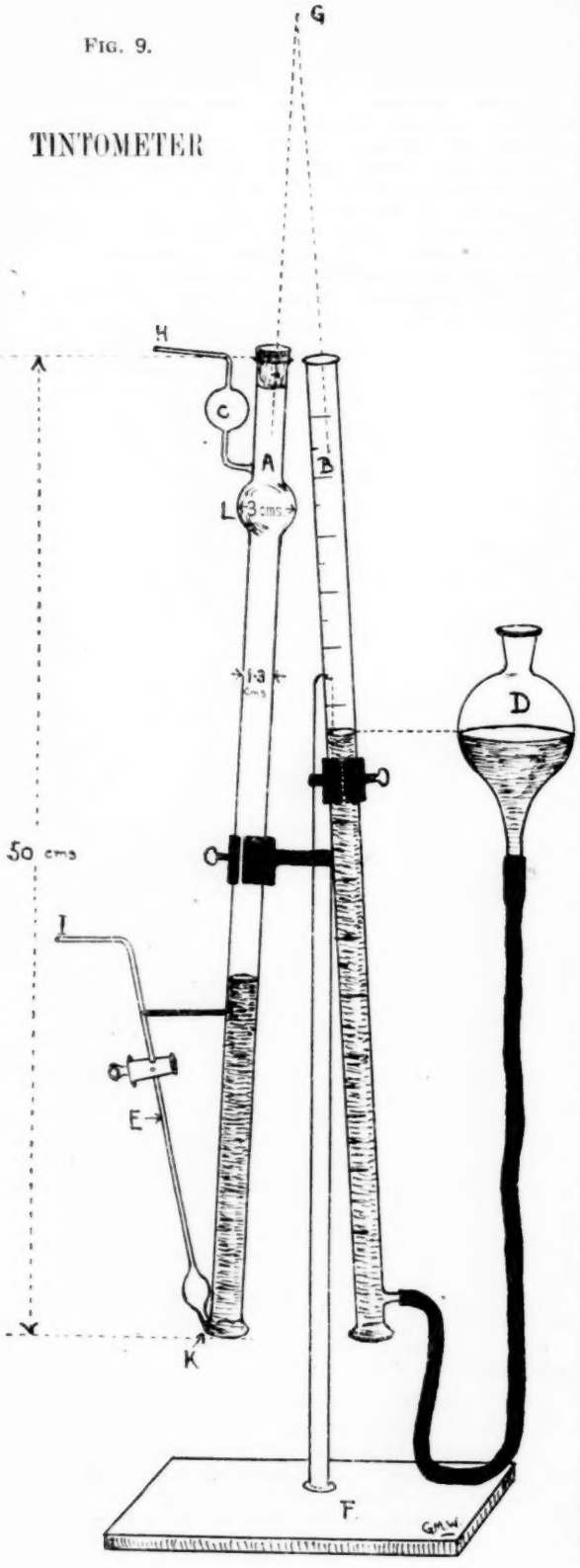
(*b*) The comparison tube.

These are held in position by means of clamps on an iron stand. Both terminate in flattened bulbs, and are made to point towards a sheet of white paper placed on the base of the stand F.

The method of using the instrument is as follows.

FIG. 9.

TINTOMETER



The top of A is closed by means of a cork. The tap on the inlet tube E is opened, and a current of air is made to pass into the apparatus at I. The bottom of the tube E is constricted at K, and this causes the air to be broken into small bubbles as it passes into a neutral solution of methyl-orange contained in A, and the rate of passing is great enough thoroughly to agitate the bubbles with the liquid. Higher up in the tube the liquid forms a series of pistons which are pushed upwards, and keep the sides of the tube wetted as far as the bulb L, where the pistons are broken.

The washed air then leaves the apparatus at H, the object of the side tube and bulb C being to eliminate any tendency for the solution to be carried from the tube by the current of air.

When sufficient volume of air has been passed the cock on E is closed, and the solution does not run back past the constriction K, but remains in the larger tube, when, after removing the cork at the top, the whole of the solution can be seen by looking down the tube.

By raising or lowering the bulb D, full of a slightly alkaline solution of methyl-orange, the level of liquid in the comparison tube B is altered until the colours seen by looking down the two tubes simultaneously, by placing the eye at the point G, appear the same.

Before passing the air the colours are matched in this way, and the level of the solution in B is read by means of the scale on the glass.

The amount by which the level of the liquid must be raised in B above its initial position is a measure of the amount of acidity introduced into the tube A. The value of the division of the scale on B are being ascertained by direct calibration with known mixtures of air and sulphur dioxide.

SCOPE OF THE METHOD.

It is realised that there are very definite limitations to the present method, however successfully it may work.

Assuming, as is highly probable, that the only acidity indicated in the tintometer apparatus is due to gaseous impurity in the atmosphere, this method does not give any indications, qualitative or quantitative, as to the acidity of suspended matter. Again, it is not at all certain that different acids, in equivalent amounts would produce the same effect on the indicator, and this opens up a new field for future investigation. Under the most favourable conditions this method will not give any indications as to the nature of the acid measured. Only the free acid will have any effect, and the combined will be neglected entirely. Other shortcomings, which should not be difficult to surmount, are as follows:—

Fatigue of the eye becomes very noticeable, and differences of colour readily seen at the first glance rapidly become inappreciable. This, however, is easily overcome by the intermittent interposing and withdrawing of a piece of blue glass between the eye and the instrument. After the passing of a volume of air, sufficient to produce a change in the indicator, the final colour is not attained at first, but gradually develops, as if the reaction between the indicator and the acid were so nearly balanced as to take an appreciable time to complete. The change, however, appears to end after about 10 minutes or even less, so that all that is necessary is to allow the solution to stand for a short time between the passing of the air, and the matching of the colours, to overcome the difficulty.

But, on the other hand, the method offers distinct possibilities in the estimation of gaseous acid from a quantitative standpoint, because if, as has been indicated above, the height of solution in the comparison tube varies directly as the amount of acid introduced into the absorption part of the apparatus

all that remains is that the apparatus shall be calibrated, and it will furnish a quick and easy method of determining the acidity of the air.

Experiments made by drawing air which had already passed through the absorption tube of the apparatus through an air filter, and comparing the shade of the paper with that obtained in a similar experiment without interposing the tube of liquid, gave distinct indications that the amount of solid matter trapped in the solution was extremely small.

It was proposed to draw, by means of a filter pump, a measured volume of air through a paper filter, then to repeat quickly, having connected in series with the filter, the absorption tube the efficiency of which was to be tested, so that the air was passed first through the tube, then through the paper filter. The shades of the filter records could then be compared. In practice the use of a filter pump was found to be unsuitable, since the reduced pressure in the meter due to the resistance of the filter-paper to the entering air caused the circular front of the meter to bulge inwards as soon as the pump was started working.

Instead of the filter pump a 15-litre bottle was fitted up as an aspirator by means of glass tubes and a rubber stopper. In this way about 15 litres of air could be drawn through the filter at one filling. The filter first used was 12 mm. in diameter, but since 15 litres of air on a fine day only produced the smallest possible discolouration on a disc of paper this size, the aperture was reduced to one-eighth of an inch. When this was done a satisfactory spot record was produced.

The method first adopted was to aspirate the air through a disc of paper, and then repeat as quickly as possible, with the absorption tube interposed. The automatic filter was set working so that any variations during the time of the experiment could be detected. Later this was abandoned, and two large 15-litre bottles were converted into aspirators. The two determinations, with and without the absorption tube, could then be made simultaneously.

After many experiments it was found that a Winkler tube full of water removed only a small fraction of the suspended matter, and a very effective absorption apparatus of another pattern was no better. It was thought that the inability of water to stop the particles might be due to the fact that they were of a tarry nature, and incapable of being wetted by water. An absorption tube of paraffin oil, chosen on account of its comparative non-volatility, was therefore tested, but found to trap no more of the suspended matter than did the water. A solution of caustic soda was found to be no better.

It was therefore concluded that, as a means of absorbing solid matter from the air, any apparatus depending upon the bubbling of air through a liquid was unsuitable. This is not really surprising, because the suspended matter will be distributed throughout the whole of a bubble, and consequently only that which is in contact with the water at the surface will have any chance of being absorbed. Even this may not be capable of being wetted if water is used, and the time taken by a bubble to pass through the apparatus is too small to hope for any appreciable settling of the particles to take place.

A rough calibration of the first tintometer has been effected by adding to the absorption tube successive drops of sulphur dioxide solution which had been standardised by titration with very dilute iodine solution. The volume of 100 such drops was measured, and it was calculated that the amount of sulphur dioxide represented by a height of 10 mm. of solution as then used in the tintometer comparison tube was of the order of $1{\cdot}9 \times 10^{-6}$ grammes.

The tintometer was compared in sensitiveness with a Winkler tube as used in the earliest experiments, when it was established that the height of liquid in the comparison tube corresponding to the amount of acid required to produce the least apparent change in colour of the solution in the Winkler tube was of the order of 65 mm., whereas in the tintometer (Fig. 6) an increment of 10 mm. is easily detected, thus proving the tintometer to be by far the more sensitive of the two pieces of apparatus.

Electrical Method of Precipitation.

An electrical means of precipitating the solid particles was tested with rather more success. The principle embodied was the same as in the Cottrell smoke-precipitating device.

A copper tube about ½ in. in diameter was fitted with a stopper at each end, through which glass tubes projected. Down the central line of the tube was stretched a piece of cotton-covered copper wire, chosen because the fine strands stood out from the electrified metal and acted as points, which probably facilitated the discharge. The tube and wire were maintained at a considerable difference of potential by means of a large induction coil. It was found that when the central wire was positively charged, and the outside tube negatively, a slow stream of smoke, blown in from a gasholder, was completely stopped, but the effect was not nearly so good when the electric current was reversed.

It was found that a glass tube about 1 in. in diameter, fitted inside from end to end with two parallel cotton-covered wires, as far apart as possible, would precipitate smoke very readily, and since the interior of such an apparatus could be seen this type was used in preference to the copper tube.

When the tube was filled as densely as possible with tobacco smoke—so that 1 mm. appeared quite opaque—and the current was switched on the whole of the smoke was removed in about three seconds.

Tested in the way already described, with the paper filter in series, this apparatus proved to be useless, the record obtained from air which had passed through it being actually much darker than that which had not undergone treatment. The effect was undoubtedly spurious, and was eventually traced to the cotton covering of the wire. The electrical potential was adjusted so that sparks only very occasionally jumped across the gap inside the tube. Presumably these sparks burnt the projecting cotton, thus giving rise to the soot which produced the black filter record. When bare copper wires were used every trace of suspended matter was removed from the air.

Complications arose from the fact that a great deal of ozone was produced. This could very readily be destroyed by gentle warming, but it remained to ascertain whether or not the sulphur dioxide would be oxidised by the ozone and precipitated, or whether this apparatus afforded a means of separating the solid and gaseous constituents of the impurities in the atmosphere.

The gaseous acids of the air can be absorbed in water, and if a means of measuring the total acidity or that due to suspended matter only could be evolved it would be possible to find the relative amounts of suspended and gaseous acid present.

The importance of this separation is great, since the solid particles will settle on buildings and plants when the gaseous impurities will remain in the air.

A modification of the electrical precipitation method, which has been considered but not yet put into practice, is precipitation of suspended matter in the absorption tube of a tintometer.

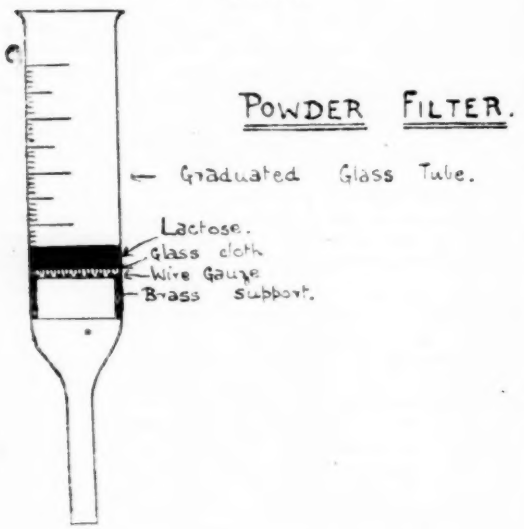
The tube could be fitted with two wires—say, of copper or silver, which should not be soluble in the liquid finally introduced, and instead of bubbling the air through the solution in the tube as before, pass it through the dry tube, and precipitate the suspended matter on the walls by means of a silent discharge. Then the methyl-orange solution could be added to a definite depth, which could be previously matched in the comparison tube, and any acidity due to the deposit on the walls could be measured.

Such an apparatus has been constructed, but has not yet been used.

Powder Filters.

A way of collecting the solid matter from the air and passing it into solution has been suggested by Dr. Owens. If it could be filtered, not on to a paper, but on to a neutral powder—preferably a soluble one—and the powder transferred to a tintometer of methyl-orange solution, the acidity, if any, could be measured in the way already described above. A filter was accordingly constructed out of a broken burette tube (Fig. 10),

FIG. 10.



diameter 11 mm., graduated on the glass. The bottom was closed by a disc of fine wire gauze, on which rested a disc of glass-wool filter cloth, a kind of coarsely woven material made of very fine glass fibres. This was used in preference to paper because—

(*a*) It offers less resistance to air.

(*b*) It is neutral, whereas paper, as usually used, is slightly alkaline.

On this was placed the powder, and the thickness of the layer could be read by means of the scale on the glass. The powder actually used was lactose, because it apparently fulfilled the necessary conditions, and was available at the time. It was gently flattened down and made quite compact. As a filter this was satisfactory. Lactose was selected because, while soluble and neutral, it could be sterilised at 105° C. without melting, and it had no inhibitory action on bacterial growth. These points are important, since it was intended subsequently to extend the investigation to the relation between smoke pollution and bacteria in the air. As far as could be seen the whole of the dirt trapped remained on the surface of the powder, and there was no evidence whatever of the lactose being drawn through the disc of glass cloth. On inverting and gently tapping the filter the powder readily fell out on to a watch glass.

A filter was made with a very thin layer of powder, not over 0·05 inch thick, and this was placed in series with a paper filter. It was found that even then almost all of the soot was stopped by the powder; very little passed through to the paper. It is then reasonably certain than a quite thin layer of lactose will form an efficient filter.

Six cubic feet of air were drawn through the powder at the rate of 1·75 cubic feet per hour. A filter pump was used, and an apparatus was devised to measure the air by means of a gas-meter, after it had passed the pump, and thus eliminate errors of measurement due to alterations in pressure. This consisted of a bottle with arrangement at the bottom for keeping the water level constant, into which the filter pump discharged. The water ran away without altering the level inside the bottle, and the air was trapped in the upper portion and measured at atmospheric pressure by the meter. (Fig. 11.)

This volume of air brought the surface of the powder to about shade 6 or 8 as used for standard paper filter. The lactose was then transferred to a tintometer tube containing methyl-orange solution, and after warming to dissolve, it was compared with a similar comparison tube, to which had been added the same amount of pure lactose; for when in large quantity lactose alone was found to slightly deepen the colour of the solution.

The material trapped on the filter was found to deepen the shade very slightly, but just appreciably. The experiment was repeated, using just over 9 cubic feet of air, but this time the air was apparently purer, and the shade produced was almost the same as before. An identical result was obtained; the colours in the two tubes were just, but only just, appreciably different. The difference was not enough to be measured satisfactorily in the tintometer.

While, then, traces of acidity were apparently indicated in the powder, it is not known to what they are due. There are only two sources for such acidity—i.e.:

(*a*) That it is due to the suspended impurity, or

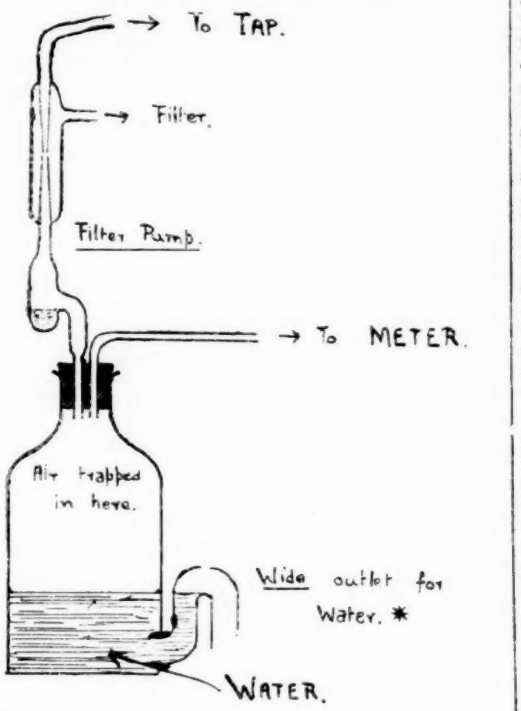
(*b*) That it is due to absorbed gaseous acid.

The lactose would certainly not be perfectly dry, and would probably tend to absorb sulphur dioxide if present. The proposed method of finding whether this was the case or not, is to use filters consisting of different thicknesses of powder, which could be measured by means of the scale on the glass, and estimate the acid absorbed. If the acid indicated in the powder were due to suspended matter only, it would be independent of the thickness of the filter layer, provided, of course, that the thickness was more than the minimum required to stop all the suspended matter. If due wholly or in part to absorbed gas, the acidity would presumably

vary as the thickness of layer, in which case the acidity due to suspended matter only would be found by extrapolation.

Should it turn out that such a filter stops the whole of the solid, but none of the gaseous acid, the method of using it would be much simplified. The deepening of shade of the methyl-orange solution already referred to when the lactose, through which air had been drawn, was added, may have been due not to acidity, but to the

FIG. 11.—APPARATUS FOR MEASURING AIR.



* This outlet is so large that water level remains constant.

presence of the dark-coloured impurity which certainly was present on the surface of the powder. It was therefore thought advisable, in the first instance, to test the lactose and ascertain whether or not it absorbed any of the gaseous acid, and the following sets of experiments were made.

Arrangements were made to draw the air through a Winkler tube alone, then through a powder filter and Winkler tube together in series, using ordinary air. The filter pump and air-collecting device already described and sketched in Fig. 11 were used, in conjunction with the ordinary gas meter, as a means of drawing the air through the apparatus, and measuring the volume passed.

At first the method was not at all successful, for after passing more than 4 cubic feet of air through the apparatus the volume of solution was reduced by evaporation to about half of what it was originally, and when it was made up to the original volume with distilled water the colour was found to be identical with that of the solution in the similar check-tube kept for comparison. This was confirmed, and the amount of acid present, if any, seemed to be too small to be measured by this means. By burning a very small piece of sulphur near the apparatus the colour of the methyl-orange solution was just made red, and the experiment was repeated. It was found that there was a very definite indication of alkalinity in the air, for the red colour was fairly rapidly changed to yellow. This might have been due to evaporation of the sulphur dioxide from solution, and so the experiment was repeated, using indicator which had been rendered acid by the addition of the smallest possible drop of very dilute sulphuric acid.

Again, there were distinct indications of alkalinity in the air, for as small a volume as 1 cubic foot sufficed to bring back the colour of the solution to yellow. This effect, which was very unexpected, may have been spurious, and due to the liberation of alkaline matter, say ammonia, in close proximity, such as in another part of the Royal College of Science Building; or it may have been that the atmosphere at the time actually was alkaline. Whatever the cause, the phenomenon readily accounted for the failure to detect atmospheric acidity during the earlier experiments and opened up a new field for investigation. With the recurrence of the meteorological conditions which prevailed during that experiment, further examples of alkalinity will be looked for. Incidentally, it may be stated that all the experiments on this matter were carried out close by an open window and a current of fresh air from the outside was directed on to the apparatus by means of an electric fan.

In order to make possible the continuation of the investigation of the lactose filter another source of acid air was tried. A few cubic centimetres of sulphur dioxide were introduced into a steel cylinder from a syphon, and the cylinder was filled with compressed air to a pressure of 110 atmospheres. This was found to be too strongly acid for the purpose, and so the pressure was released to atmospheric and the cylinder was re-charged to the same extent as before without adding fresh SO_2. The air was then found to be quite free from smell of sulphur dioxide, but was slightly more acid than the average air in winter. A very slightly alkaline solution of methyl-orange was used in a Winkler tube in the usual manner, and the volume of air from the cylinder required to produce a change of colour was found to be about half a cubic foot. The end-point was extremely good.

The method adopted was to pass air from the cylinder through the Winkler tube of solution and then into the gas meter, using flexible metal tubing as connexion between the absorption tube and steel cylinder. The volume required to produce a change was noted and the whole was repeated, placing the filter with a layer of lactose, 8 mm. thick, between the cylinder and Winkler tube. It was necessary in this case to use a rubber stopper as connexion, and this was the only place where the air came into contact with anything but metal.

The results did not agree absolutely, but taking the mean of 20 experiments it was concluded that the lactose did absorb a little sulphur dioxide, but the quantity was negligible. Whereas 30·0 arbitrary units* of air were required to produce a change when the Winkler tube alone was used, the volume required to do the same with the lactose filter interposed was 31·6 units. The lactose was dissolved in a tintometer tube of neutral methyl-orange solution, but was found to produce no

* 1 unit = 1/12 of a cubic foot.

change of colour. The figures obtained in these experiments are given below:—

Volumes Required to Change the Indicator.

A. Without the Powder Filter.	B. With the Powder Filter.
26·9 units.	28·5 units.
28·7 ,,	29·0 ,,
28·4 ,,	31·1 ,,
28·4 ,,	32·0 ,,
29·2 ,,	29·2 ,,
28·3 ,,	33·3 ,,
33·0 ,,	32·7 ,,
30·4 ,,	34·0 ,,
37·0 ,,	35·0 ,,
Average 30·0 ,,	Average 31·6 ,,

Experiments A. and B. run alternately.

These results are based on the assumption that the only acid in the cylinder was gaseous, which would probably be the case, for although a process of slow oxidation of the sulphur dioxide would almost certainly take place inside the cylinder, the sulphuric acid produced would be left on the walls of the vessel. The experiments took several days to complete, and so the oxidation would be so slow that the sulphuric acid would have time to settle as fast as it was formed. This explanation readily accounts for the steady increase in the figures cited above.

The lactose filter, therefore, appears to be a satisfactory means of separating the suspended and gaseous acid of the air, for if 8 mm. of powder only absorb so small a proportion of sulphur dioxide from the air, that retained by a thin layer of 1 mm., such as is necessary for the filtration of the suspended impurities, should be negligible.

The general conclusions drawn from the Acidity Research may then be summarised as follows:—

(*a*) The lactose filter has been found to provide a means of separating the suspended from the gaseous parts of the acid in the atmosphere. From this research, and the results of Professor Gee's experiments, it is known that water, in a suitable absorption apparatus, will take up a great part of the acid from the air; and, furthermore, that a limit is soon reached with such an apparatus beyond which no further acid is withdrawn from the air, so that all the acid which can be stopped is taken out practically completely by one absorption apparatus. Results have also shown that suspended matter is not trapped by such treatment, therefore the acid which is capable of being taken up by the water must be the gaseous part. It follows, therefore, since the whole of the gaseous acid can be absorbed in a tube containing an aqueous solution, that by using the tintometer in conjunction with a lactose filter we have a method by which both the acid in suspended impurities and the gaseous acid can be determined.

(*b*) It appears to be necessary to abandon the assumption that the air will be always acid, and to provide for the possibility of its being alkaline. Further investigation is required upon these lines, particularly to ascertain whether the results already obtained are due to artificial conditions, or are to be expected as an accompaniment of certain types of weather.

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